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Editorial:
Which Way for American Science? . . .

ATOMIC ENERGY ENTERS CIVILIAN LIFE

Three months after the Atomic Energy Commission was legislated into being by the McMahon Bill, the President has announced the names of its members. They are good names—the Chairman, David E. Lilienthal; the members, Robert F. Bacher, Lewis L. Strauss, William W. Waymack, and Sumner T. Pike, are men of good will. They are also outstanding men of action and administrative experience. The Chairman, in particular, brings with him the reputation of a proved administrator of a gigantic public works project, a victor over red tape and political patronage—exactly the qualifications needed for the great task before him. His familiarity with the political and social aspects of atomic energy is well known.

The scientist on the Commission—Professor Bacher—is a leading authority in the field of atomic energy, and has also actively participated in the work of the UN Commission. All scientists acclaim his choice and his decision to devote himself to his work.

Loyal cooperation between the new Commission and any international authority which may be established by the United Nations, is certain. In the eyes of the world, the appointment of Lilienthal and his colleagues must appear as a demonstration of the will of America to dedicate atomic energy to peaceful progress of knowledge and well-being of man. In this the new Commission can be assured of the whole-hearted cooperation of all scientists.

The caliber of the men who have accepted the appointments on the Commission belies the prophecies freely made by the proponents of a dictorial Administrator and a dollar-a-year advisory board. We hope that the Commission will achieve the same success in the appointment of its Manager, Division Directors and other key personnel. A "high Army official" was quoted by newspapers as saying that the Commission will have to fall back on officers on active duty because no outstanding civilian will agree to accept employment at government salaries. Once a congenial atmosphere of common scientific endeavor is established in the laboratories and plants of the Commission, we have no doubt that the best scientific and technical talent will be available to it. Outstanding young scientists and engineers will be glad to become members of a group which for years will remain the advance guard of the most spectacular development of science and technology.

SCIENCE, A BRANCH OF THE MILITARY?

Several articles in this issue are devoted to the position which the Armed Forces are rapidly acquiring in the organization of American science, largely because of the failure of the 79th Congress to establish a National Science Foundation. The history of this failure is traced in Prof. Parsons' article.

Apart from the laboratories operated directly by the Armed Forces (which at present still include the colossal layout of the Manhattan District), the Army-sponsored research accounts, in the current year, for an expenditure of 70 million, that of the Navy, for over 20 million. Compare this with the total of 30 millions available for scientific research at the Universities in 1940, and we understand why "Business Week" says: "the odds are getting better all the time that pure scientific research will become permanently a branch of military establishment."

The articles by Profs. Morrison and Stern in this issue are eloquent pleas for a reversal of this trend. A few months ago, commenting on the passage of the McMahon bill for civilian control of atomic energy, we said that a growing belief that the United States is engaged in a gigantic arms race, would lead to a rising tide of military domination over all activities of potential use in war.

We realize that the Army or Navy is proceeding in a reasonable fashion in granting liberal contracts for fundamental research.

But having granted this, we must emphasize that organizational subordination of science to the Armed Forces is an evil thing. What would the American people say if the schools of the nation were taken over by the military—because civilian authorities failed to provide them? Even if the Army were to double the number of teachers and to provide them, at long last, with adequate salaries, public opinion would still be horrified. It would deem it, and correctly, treason to the basic tenets of education in a free society.

It should be clearly understood by the public that free scientific inquiry is as integral an element of a civilization based on individual freedom, as is free education and free expression of opinion. Without it, this civilization cannot retain its leadership in various spheres of human endeavor—not even in that of military power.

The fight for the liberation of science at large from military sponsorship—first of all, for an adequate National Science Foundation—must be taken up with the same vigor as was the now victorious fight for the civilian control of atomic energy.

E. R.

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Atomic Energy and World Peace . . .

. . . . . Harold C. Urey

Alfred Nobel, the anniversary of whose birth we celebrate today, was as we all know the inventor of high explosives, which have proved to be useful in peace and war. He was also a man who throughout his life studied and promoted all possible methods for the avoidance of war. Many scientific men today, of far less eminence than Alfred Nobel, find themselves in a similar position. We have produced explosives of far greater effectiveness and power than any of which he dreamed, and we also do not wish to see these explosives used for war purposes. Also, many of us, when we meet with criticism for our non-scientific activities, turn to the example and the spirit of Alfred Nobel for approval, and hope that history deals as kindly with our endeavors as it has with his. No one today criticises his activities in behalf of the abolition of war, though the "realists" of his time undoubtedly regarded his ideas and activities as visionary and impractical. We respect him today as a scientist and engineer, as a man of broad interests and culture, as a man of vision and courage, and we pay tribute to his fellow-citizens of Sweden and the world who have done so much to maintain the lustre of his name.

Today, on popular occasions of this kind, we usually discuss some aspects of his attempts to bring peace to this planet, partly because of the difficulty of discussing scientific and engineering problems before a popular audience, but more because of the transcending importance of the problems of war and peace which he so early foresaw. Probably never before has this problem of settling the world's disagreements by methods other than war been so universally discussed as it is at the present time, and probably never before has it been discussed more intelligently than it is now. Experience of the past does not encourage optimism, but war has become so effective that we feel impelled to work and speak for the abolition of war, even though we may think that the probabilities of success are small.

This address was delivered before the American-Scandinavian Foundation at the Nobel Birthday Fete on Oct. 21

A YEAR WITH THE BOMB

A year ago I reviewed the situation in regard to the atomic bomb and the general conclusions to which it forced us. Any such discussion could hardly have been expected to be perfect, but today I see no reason to retire from the positions taken at that time. The technical methods of waging war are now so effective that they are well-nigh intolerable even without the atomic bomb. If these bombs are manufactured and stored by any government of any kind, they will eventually be used, and if used on a sufficiently large scale, they may completely destroy our civilization. It is to be hoped that methods can be devised which will make it possible to stop such manufacture. In some way the present international anarchy of war must be replaced by world law which requires world government in a true sense. I am surprised and gratified at the greatly increased appreciation of the situation created by the atomic bomb and other modern weapons of war, and particularly by the greatly increased acceptance of the necessity of ultimate world government, by many people of this country.

However, even after a year's time in which the problem has been thoroughly discussed, many thoughtful people still believe that atomic bombs may be useful in order to enforce peace. I merely wish to reiterate the statement made a year ago, that atomic bombs are evil and that they cannot be used to maintain peace. To maintain peace by the use of the most powerful weapon of war which has ever been devised is a complete contradiction in terms; so contradictory, in fact, that no effective use of the atomic bomb could possibly be made. In order for a weapon to be effective for the preservation of order, it must be appropriate to that purpose and it must be one which mankind is willing to use for that purpose. It is the completely inappropriate character of this weapon which makes it useless as a police weapon. It will be used only by those who believe that the proper way of settling international difficulties is by the resort to war.

IRRESPONSIBLE TALK OF PREVENTIVE WAR

Today I wish to discuss other aspects of this problem. During the last few months public discussion of international problems, in this country at least, has moved rather dangerously toward a consideration of so-called preventive war. One sees this tendency perhaps most markedly in the trend of news in American newspapers, but our fears in regard to such a war are also not particularly quieted when the high-ranking officials of large countries feel that they must make statements denying the imminence of war in the immediate future. This advocacy of a preventive war is not made openly, but largely by inference. It first came to my attention when a commencement address made at Swarthmore College last June* was reported in the American press in August as advocating an immediate attack upon other countries. Some statements in that address were not qualified as much as they should have been, but it is nevertheless true that an address delivered before an audience of a college of the Society of Friends without objection on their part, and in fact, with indications of approval, was reported by the American press in quite a different light. Since that time I have noticed, and perhaps you have, a tendency for the headlines of news to suggest the necessity and desirability of solving our difficult international situations by violent means. Those who consider war as a means of settling our problems should fully appreciate the great danger in such an undertaking, to us in this country as well as to the peoples of the whole civilized world.

First, of all, this point of view is not one widely held by the people of the United States. Frightening news may result in an increase in the number of newspapers purchased and read, but it does not necessarily indicate a desire on the part of the people of the United States to engage in any aggressive war.

* This address, by H. C. Urey, appeared in Air Affairs v. 1 no. 1, August, 1946.

We in this country read our newspapers and listen to our radio with a healthy scepticism, and reserve to ourselves the right to make our own decisions. Also, after a world war, it is almost inevitable that extensive military preparations will continue after the close of the war, largely because of the momentum acquired during the war, and such activities do not necessarily mean general approval on the part of the sovereign people of this country. The United States has changed its position in the world with respect to its defense in a marked way, largely because of the effect of the airplane and now of the atomic bomb. This country was isolated to a very large degree until this century, but today that isolation has been physically destroyed. This changes the thinking of many people of this country, and leads many individuals to think of solutions for this problem of insecurity which appear to be quick and definite, but which may be anything but that, and in fact may prove to be very painful and destructive, to us as well as to others. However, I have the greatest faith in the innate good sense of my fellow-countrymen, in spite of the disturbing fluctuations in its exercise over short periods of time.

PREVENTIVE WAR—AN ILLUSORY SOLUTION

But let us consider in more detail the fallacy of preventive wars as a solution to our present difficult international situation. There is a tendency on the part of some to discuss such matters in hypothetical ways, but this is not usually done. Hence, let us ask the question as to what is the most likely source of war in the world at the present time. It is useless to assume that important wars will arise from small countries, and because of the threat of the airplane and the atomic bomb, it is probable that all the countries of Europe will realize that they are small. This leaves only the U.S.S.R. and the United States as the possible contestants in any war that we foresee in the immediate future, and this is tacitly assumed in all references to war in the near future. Some thoughtful people both here and abroad believe rightly or wrongly that this country may attack while only we have the atomic bomb, and further assume that such an attack could be easily made and quickly won by this weapon alone. Not more than a small minority of our people believe this, but those suggestions are so dangerous, to my mind, that it is worthwhile clearly and publicly to discuss the consequences of such action.

PROBABLE COURSE OF SUCH A WAR

In order to attack, we must think of bases from which the attack would be made. We might think of those bases in the United States, but if so, war planes must cross the territory of other countries in order to attack. Perhaps someone thinks that Northern Canada would be an appropriate base, but Canada is not part of the United States, and hence military collusion with that country would be required. Others perhaps think of England as such a base, but again England is not part of the United States, and certainly she could not view with favor the use of that island as a base of attack. It would be highly unpleasant to the English people, and the cooperation of England might not be secured, and I think probably would not be secured. We might think of the Middle East, but we should note that it is halfway around the world from us. We might consider Japan, which we now occupy, or some bases in that neighborhood, but it is easy to see that no vital points of Russia are immediately accessible from those positions. It is not easy to see how anyone seriously considering this problem would propose to start and maintain such a war.

We must also consider what the possible consequences of such an attack would be. All Europe would be almost immediately occupied by our enemy. And this would entail eventually another landing in Europe and a longer and slower and more laborious battle across that continent, with the complete destruction of the cradle of European civilization the inevitable result.

Perhaps some have harbored the idea that conquests can be made and maintained in the future by the use of the atomic bomb alone. An enormous amount of damage undoubtedly could be inflicted, and if systematically repeated at intervals, the industrial potential of other countries could perhaps be kept so low that the manufacture of major weapons of war of any kind would be impossible. Such a course of action is fantastic, and will be regarded as such by the people of any country or any race. In order for a preventive war to avoid such a course, it would be necessary to follow the initial bombardment with an attack using other means, and by the eventual occupation of the enemy country. This in turn would require another landing on beaches somewhere, and a long and bloody trek across continents again. Such prospects can only cause the greatest fear on the part of people who live in countries which may lie in the path of such battles.

The almost insurmountable problems of occupation which would follow such a war are apparent. It is only necessary to note our occupations of Germany and Japan to realize that occupations after such a preventive war would be far more arduous than those we have now. This problem of occupation would be far more difficult than that which we face in these countries at the present time, and without such occupation this line of action presents no solution to the world's problems at the present time.

THE SOCIAL IMPLICATION OF PREVENTIVE WAR

Many people of the United States understand this situation and see clearly the impossibility of a small preventive war. They know that wars in the future will be world wide, and that they will bring the whole aftermath of difficulties that we have observed after World War I and World War II. Moreover, a great fraction of the people of the United States, as well as those of other countries, regard this whole question of aggressive war as thoroughly immoral. It violates their innate sense of decency. Before this country can be brought to a point where an aggressive war can seriously be undertaken, it will be necessary to change the thinking habits of the overwhelming fraction of the population of the United States. In order to change these opinions of the people of the United States, an extensive re-education program would be vitally necessary. Germany undertook such a program in the 1930's, but in spite of all such propaganda on the part of the German Government in the years before the war, it felt that it was neces-

sary to introduce concentration camps in order to silence a German minority. It is to be expected that if any aggressive war is undertaken by the United States, similar procedures will be required, for there would be a very determined minority at least who would choose concentration camps and death rather than sanction either actively or passively the total immorality of a preventive aggressive war. The Christian and Jewish religions have too strong a hold on the morals and ideals of our people to permit them to do otherwise. Briefly, the democratic institutions of the United States must be effectively destroyed before such an aggressive war is possible.

In the minds of many people who may consider the possible advantages of preventive war of the type that I have mentioned, there lurks a great fear of Communism. I myself thoroughly believe that our political institutions and economic institutions of the Western world are far superior to those practiced in other parts of the world. In fact, I sympathize with those who do not wish to see our democratic institutions and our free economic system destroyed, and with a substantial fraction of the world disagreeing with our views in this respect, the danger to such institutions is not at all negligible.

On the other hand, let us trace briefly the course of free institutions after World Wars I and II. I can so well remember how representative government seemed to be steadily increasing its hold over the masses of the peoples of the world before World War I. There was a stable government in Germany before that first war, and there was in it the definite element of government by law rather than by men. There has been no stable government in Germany since that war. Freedom and democracy as understood by us never did exist in the eastern part of Europe, and does not exist there now. Italy became a dictatorship, as did Spain, and a dictatorial military clique secured complete control of Japan in the years between the wars. After World War II it is perhaps too early to judge trends correctly, but I cannot see that democratic institutions have any reason to feel more confident now than they did before the war, and I do not believe that free economic systems have reason for more confidence than they had before. The effects of wars on the economic side is again to destroy freedom. In all its attributes freedom is a delicate plant, which thrives only in the soil and air of peace and security. A modern war necessarily disturbs the economic foundations of our society, for it increases the control of government over all phases of the economy as well as other institutions of a free country. It is to be expected that after any future war the problem of restoring freedom in all its aspects to a country such as this will be far greater than it is at the present time.

THE POSITIVE SOLUTION—WORLD GOVERNMENT

The solution of the problems which face us today and which were such a great concern of the man whom we honor today, cannot be made on the basis of statements and arguments in regard to things which should **not** be done, and these remarks are distinctly on the negative side. Moreover, such a vast problem must be solved by comprehensive methods, though such methods must necessarily consist of a succession of many detailed steps. A great human problem can be solved only by great and glorious ideas that cause men to lose their individual selfish and narrow desires in a great emotional and intellectual crusade. The existence of the United Nations indicates the great desire of people for a solution in this century. That fundamental desire will grow in the years to come as people everywhere realize the enormous destructive powers of the airplane and other flying vehicles, and of the instruments of war which they carry. It will also grow the more we use rapid means of transport and communication in the years to come. People will realize the essential unity of our species regardless of the variations in colors of skin, sounds we use in speech, and religious tenets.

But wishes and desires will be frustrated without proper mechanisms for their realization. More and more people realize what these instruments are, and also the price which must be paid for them. Also, leaders are appearing who are fearlessly stating what these are. Mr. Wendell Willkie left a monument more enduring than granite in the words "One World," and he meant a **free** world. Others such as Mr. Harold Stassen courageously pronounce the words "World Government" and "sovereignty," and point their meanings. World Government in my opinion is the proper intrumentality to solve this age-long problem of recurring wars. It is also the idea to rally the hearts and minds of men. It is easy to state this conclusion, but the road ahead is difficult and dangerous, and it is not possible to map in detail the exact course to follow, but if we do not clearly and fearlessly realize and fearlessly state the ultimate objective, it is not possible to guide our steps toward that end.

Today war, in spite of the United Nations as it is at present constituted, is the ultimate method of deciding controversies between nations and groups of nations. It cannot be eliminated as the ultimate method of decision unless some other method is introduced for this purpose, and this method must be the only method available for this purpose, for two or more ultimate methods cannot exist at the same time. The only substitute for the anarchy of war that has ever been discovered and proved over limited areas of the world for any great period is the establishment of a system of legal methods for settling disagreements. It is not possible to establish laws without a government to make laws and enforce them. World law without a world government cannot exist. International law as discussed at the present time has the same basis and force as the ten commandments. Such moral laws are very important, but they cannot be codified or enforced by courts, and hence offer no security to the law-abiding against the criminal minority.

Finally, "wars to end wars" may be a high-sounding statement, but the experience of the past shows that it is only that. Peace is not the absence of war, but the existence of justice and order. Wars only make the establishment of peace more remote and more difficult of attainment.

These statements I make with conviction, though I make no claim to infallibility with regard to them. I only hope that they will be considered seriously. I hope that such ideas may rally the great, the good, and the fearless to a cause dear to Alfred Nobel, who in his lifetime and in the years since he lived has done so much toward the solution of this important problem.

The Laboratory Demobilizes . . .

. . . . . *Philip Morrison*

A little more than a year ago we first met Professor Tsuzuki, the Tokyo radiologist. He came to the bustling temporary headquarters of General MacArthur in that first confused week of the occupation to tell us about Hiroshima. He is a small, quiet man of great dignity and used to deference. He showed us his reports of the radiation casualties in Hiroshima, and with an air of detached, scientific enthusiasm, he gave us reprints describing his work as a young man in Philadelphia. At that time he had induced radiation deaths in rats by acute doses of X-ray. The symptoms he had noted so carefully in the rats who died twenty years ago were plainly parallel to those familiar by now in the patients who crowded the temporary hospitals of Hiroshima. In real concern Professor Tsuzuki grasped my arm and said: "I did the experiments years ago, but only on a few rats. But you Americans—you are wonderful. You have made the human experiment!"

No one could fail to carry the scar of such a cutting thrust. We knew that American science and industry did not bear the guilt for those tragic deaths; we did not need to apologize. Our science had engaged in a total war, a war for survival; more than that, a war for the defense of culture itself. In that war we could withhold no decisive weapon. But Tsuzuki first made clear to me how heavy was the responsibility on science, and above all science in America, to help justify in the years of victory the wasteful horror of war.

I should like then tonight to talk about somewhat confidential questions. They are mainly matters of professional concern; they worry physicists like me. But in the last year we physicists have seen how our private concern is related to the concern of all, and other speakers tonight have made very plain that there is a real and grave tie between scientists and every man. About a year has passed since the war ended; and in that year science has not learned how to demobilize. It is my thesis that this is not only a shameful but a dangerous and a foolish state of affairs and I should like to tell you how it came about.

THE MOBILIZATION OF SCIENCE DURING THE WAR

You all know what happened to science —and I speak mainly out of my own experience of American science—in the war. It was mobilized with fierce single-mindedness for war. Not even a good seed crop was left in the schools. The tree of scientific knowledge was shaken hard for its fruits. Off they dropped; radar and its related techniques—proximity-fuse, guided missile, television, the atomic bomb, and many less spectacular but very useful things, for example, the application of statistical analysis to air operations.

The Office of Scientific Research and Development, an independent agency under Dr. Vannevar Bush, spent several times more for research each year than had ever been spent before. That money was spent in two ways: Hundreds of laboratories in industry and universities the nation over were given jobs to do on a contract basis; and several very large and tightly-organized laboratories were set up and operated to do key work, like the famous Radiation Laboratory in M.I.T. where radar was largely developed. The laboratories of the Manhattan District were of the latter kind. Results were spectacularly good. The services and the entire informed public came to view scientific research as a central activity of war. It was perhaps not widely realized that wartime research had lost much of its character as research and had become programmatic research or development. Roughly the two activities are distinguished by their objectives: Research attempts to increase knowledge, which brings with it the power to control phenomena, but does not set itself defined goals; while development, which in wartime used research personnel and many research methods, has a defined objective. A true research laboratory should find it hard to say what it could mean by finishing its job; a development laboratory knows when the bomb or the radar set or the anti-malarial drug is working according to specifications. War experience showed that the extraordinary pressures of war could bring great accomplishment from the large laboratory, and that from a heavily supported effort worthwhile results almost inevitably flowed. This was a well-learned lesson; I am afraid it is too well learned.

Nuclear physics is not an average field of science; its connection with bombs and turbines and rockets is a little too close. But I believe it is a typical one; within this field are now exhibited in full clarity what many fields of science feel as more or less inexplicit trends. Nuclear physics today—and I speak only of academic research in that field—is very like big business. There was a conference last month of nuclear physicists at Princeton. Most of the talk was on the abstract problems of the fundamental particles. But the people who came were not in the least abstracted. The same college at Princeton houses annually labor-management conferences of similar size, and one of the men in charge of arrangements told me that the physicists had about three times as many wire and phone messages as the business men and union leaders who attend the industrial relations meetings! The nuclear physicists are, as you well know, busy in the UN. The Army is sending some of its officers to Princeton to enter the field. The Manhattan District is now operating four laboratories —Brookhaven, Argonne, Berkeley, and Oak Ridge—of which the smallest proposes to do more work than the largest laboratory in the country did before the war. At least half a dozen universities have plans which only California would have contemplated in '39.

MILITARY FUNDS NOW CHIEF SUPPORT FOR U.S. SCIENCE

The money, and it is real money, well in the tens of millions a year, is coming today from two main sources. The Army, through the Manhattan District, working chiefly through the large laboratories just mentioned, is a major supporter. In principle, however, this support will come from a special agency, the Atomic Energy Commission, when that body shall begin to function. The other large source of funds is the Navy, through a new bureau called the Office of Naval Research. To indicate how much nuclear science owes to the services, a few examples will be useful. At the last Berkeley meeting of the American Physical Society, just half the delivered papers—mind you, perfectly open, published papers on problems of essentially academic interest—were "supported in whole or in part" by one of the services. Again at Berkeley, there exists one of the best-supported and strongest physics departments in America. But for every dollar the University of California spends in physics at Berkeley, the Army spends seven. The Navy may be said almost without hyperbole to own all of nuclear physics which is not owned by the Manhattan District. About thirty colleges have Navy contracts in the field of nuclear physics alone. Some schools derive ninety percent of their research support from Navy funds. My own department is one of those with relatively little service money; we get about a quarter of all our money from the Navy.

Address at the Atomic Energy Session of the New York Herald-Tribune Forum on Oct. 29. Reprinted by permission of the N.Y. Herald-Tribune.

What is this money spent on? There are, to be sure, some extraordinary developments going on in this country, of a somewhat bellicose kind. Most of the universities, however, are engaged in work not even indirectly supporting the development of weapons. They are doing plain —or perhaps it would be more honest to say rather fancy—academic research. There is, of course, a fashion, which prescribes that everybody who can talk the Office of Naval Research out of enough money builds a big machine to make very high energy particles. But all the work is at least peaceably intended.

The Navy contracts are catholic. They are written for all sorts of work. The ONR has put out a little wall chart which contains useful numbers of all kinds for ready reference, which is somehow symptomatic of the whole confusion. The chart has a mixture of numbers: some of the kind most conventional for physicists, like the velocity of light, and the charge on the electron stand side by side with numbers whose interest derives almost wholly from the atomic bomb and with those of a highly speculative but fashionable kind, like the "weight" of the still poorly known mesotron. To see these data on your wall over the Navy's signature is to fancy yourself part of a rather poor musical comedy.

FORESEEABLE DANGERS IN MILITARY SUPPORT OF SCIENCE

Some of the apprehension that workers in science feel about this war-borne inflation comes from their fear of its collapse. They fear these things: the backers —Army and Navy—will go along for a while. Results, in the shape of new and fearful weapons, will not justify the expenses, and their own funds will begin to dwindle. Then now-amicable contracts will tighten up and the fine print will start to contain talk about results and specific weapon problems. And science itself will have been bought by war, on the installment plan. The easy money for the fashionable problems will lead to an unbalanced development within science itself. The teaching of students—right now a desparately pressing problem if we are to have any science in the years to come—will suffer because of the urgency of research demands. The practice of patenting scientific results and techniques will be spread from the industrial laboratories where it was built and the government laboratories, where its value is doubtful, to the laboratories everywhere, where its effect will be to destroy the traditional free cooperation of science. The armed forces are always sooner or later concerned with secrecy, and with the restrictions such concerns imply on the travels, publications, and even the characters and background of their research workers. Such restrictions will greatly harm our science. It will become narrow, national, and secret. Above all, and in spite of every protestation, American science will appear to the world as the armorer of a new and more frightful war. We are not far from giving that appearance today.

The physicist knows the situation is a wrong and dangerous one. He is impelled to go along, because he really needs the money. It is not only that the war has taught him how a well supported effort can greatly increase his effectiveness, but also that his field is no longer encompassed by what is possible for small groups of men. There is a real need for large machines—the nuclear chain reactors, and the many cyclo-, synchro-, and beta-trons—to do the work of the future. He needs support beyond the capabilities of the university. If the ONR, or the new Army equivalent, G-6, comes with a nice contract, he would be more than human to refuse. The result is necessarily bad. The ONR contracts are in most cases models of restraint, and assiduously avoid the most common errors of unjustified secrecy or patent restrictions. But either the work is military, and the physicist working for war purposes, or it is not; and the Navy and the Army ought not to support and, in the long run, control it. To be sure the military must do their own research. But they cannot do all research. The best security will always be a strong and healthy nation, in which science has a recognized and independent place. The national support which science must have, it must get from an agency whose purpose it is to aid research, and not from those who have primarily other responsibilities.

THE URGENT NEED FOR A NATIONAL SCIENCE FOUNDATION

The present situation is perhaps temporary. The Atomic Energy Commission has not yet started. The Navy says that it supports what it admits is work of no direct Naval concern as an interim contribution to the national welfare, a good and ingratiating way of getting rid of Navy surplus funds. But what will take its place? In the last Congress there died in the House a bill to set up an agency devoted to the support of scientific research and to the education of scientists. The bill was known as the National Science Foundation Bill. It proposed to set up a government administrative body which would allot funds for research and for education in science. The success of the OSRD in wartime was the chief argument for the measure. In final form it was supported by the one man most influential and experienced in the problem, the wartime head of the OSRD, Dr. Vannevar Bush. But the bill died in House Committee, and it did not there get the full support either from OSRD or other circles which might have at the end saved it. Meanwhile, with the closing of the OSRD Dr. Bush became chairman of a new joint Army-Navy Committee for the coordination of their research efforts. But it is the contention of this talk that such efforts can not be a peacetime continuation of the OSRD. Only a National Science Foundation can hope to bring to peacetime fruition the promise science held out in war. Such a bill will surely come out next session. If real public attention is given to its proper drafting and genuine support to its principles, it must pass. I urge of you that attention and that support.

In a series of talks on the world issues of atomic energy mine must have seemed a minor family problem, hardly weighty enough to demand attention. I am convinced that it is not. In every sphere of life we must prepare for peace if we are to have it. We have seen a year of tension based on no new great and transcendent differences, but on a whole front of local alignments and specific incompatibilities. Each of us must demobilize in his own way if he is to share in the peace. We in science have to demobilize the laboratories, and earnestly to prepare for the peace we won with victory. To do less is to accept the scorn of Professor Tsuzuki, and to replace the hope and the understanding that stem from knowledge with the fear and the bitterness of Hiroshima.

National Science Legislation [1]

Part I: An Historical Review

Talcott Parsons

Pres. Carl C. Taylor of the American Sociological Society and Prof. Parsons have graciously permitted the Bulletin to publish the first part of Prof. Parsons' article prior to its appearance in the American Sociological Review. We consider it to be an excellent introduction to a subject of prime importance to both natural and social scientists. The rest of this article, which deals with the role of the Social Scienses in a National Science Foundation, will be published in a subsequent issue.

THE SCIENCE LEGISLATION AND THE ROLE OF THE SOCIAL SCIENCES

The proposals to establish a National Science Foundation, which are of paramount interest to social scientists as well as to those in the other scientific disciplines have, after being before Congress for over a year, failed to get action in the closing weeks of the last session. This misfortune makes it all the more imperative that, in preparation for the new phase of the debate, all groups who have an important stake in the legislation should be fully informed about the issues so that they can exert the most intelligent influence on Congress when a new bill is introduced as it almost certainly will be in the next session.

The obligation of social scientists is not only important because of their own immediate interest in the consequences of the proposed legislation. For, since the question of whether or not to include social science in the scope of the Foundation has been one of the most controversial questions, a satisfactory settlement of the whole issue cannot be arrived at without the fullest possible clarification of the role of social science. And surely this in turn cannot be arrived at without bringing to bear the best informed and most fully considered opinion of social scientists themselves.

A brief history of the legislative proposals in this field will be useful to preface a discussion of the issues involved for the social sciences. On July 5, 1945, Dr. Vannevar Bush, Director of the Office of Scientific Research and Development, published his report entitled **Science, the Endless Frontier.** This report was the outcome of a study made at the request of President Roosevelt, of the ways in which the benefits of the mobilization of the scientific resources of the nation for the prosecution of the war, which had center in OSRD, could be carried over to peace time.

THE DISTINCTIVE FEATURES OF THE MAGNUSON AND KILGORE BILLS

The principal recommendations of the "Bush Report," as it has generally been called, were soon embodied in a bill which was introduced into the Senate by Senator Warren Magnuson of Washington (S-1285). At about the same time Senator Harvey Kilgore of West Virginia introduced an alternative bill (S-1297). For the most part, the controversies over the legislation have centered on the differences between these two alternative bills. And the rift between their advocates was not successfully healed at the time that the proposals expired with the adjournment of the Session.[2]

The Bush Report and correspondingly the Magnuson Bill, recommended that the Foundation be governed by a Board of nine members, none of whom should be full-time Government employees, but who should be taken from private life, principally, though not exclusively, from among eminent scientists. In contrast the Kilgore Bill provided that the Foundation should be headed by an Administrator, appointed by the President. The Kilgore bill provided that there should be an Advisory Board, but without power, and one which would be considerably larger than that proposed in the Magnuson Bill. This would be composed about half and half of persons drawn from outside the Government and of representatives of the various Government departments and agencies which had an interest in the work of the Foundation. This was the most serious difference between the two bills and the one over which there was the most controversy.

The other two most important differences were over patent policy and the inclusion of the social sciences. The Magnuson Bill involved no innovations in patent policy, following the practice of OSRD, which left it open to private interests to patent results of work which had been in whole or in part supported by Federal funds unless this right was specifically restricted in the terms of the contracts under which it was done. The Kilgore Bill, on the other hand, provided for rather radical innovations in this field, including a blanket prohibition of the patenting of results growing out of Government-supported research. Finally, the Magnuson Bill did not include any specific provision for the social sciences,[3] though they might have become involved indirectly under its terms in so far as they could have been held to contribute to national defense, to health, or to welfare. While the original Kilgore Bill did not include the social sciences, in the revised form introduced in October, 1945, social science research as part of the "basic sciences," was provided for, though not as a separate division of the Foundation.

The next important stage in the story was the message of President Truman to Congress of September 5, 1945. In this message the President, broadly endorsed the policies embodied in the Kilgore Bill. He strongly recommended that Congress enact legislation establishing a Science Foundation, but he recommended that an Administrator and not a Board have the primary responsibility, and specifically that the social sciences be included.

THE HEARINGS AND THE FIRST COMPROMISE MOVES

On introduction, the Kilgore Bill had been referred to the Committee on Military Affairs of the Senate, while the Magnuson Bill was referred to the Commerce Committee. It was, however, arranged to hold joint hearings on the two bills under the auspices of the Subcommittee on War Mobilization of the Committee on Military Affairs, of which Senator Kilgore was Chairman. These hearings began on October 8, 1945, and produced a large volume of testimony by more than one hundred witnesses.[4] These included many eminent scientists, Government officials, and interested laymen. One day, October 29, was specifically given over to the problem of the role of the social sciences as presented by the Social Science Research Council, which, among organized social science groups, took the primary initiative in this matter. The case was presented by Dr. Wesley C. Mitchell, Professor Emeritus of Economics at Columbia University; Dr. John M. Gaus, Professor of Political Science at the University of Wisconsin; Dr. Robert M. Yerkes, Professor Emeritus of Psychobiology at Yale University; Dr. William F. Ogburn, Professor of Sociology at the University of Chicago; Dr. E. G. Nourse, Vice-President of the Brookings Institution, and Monsignor John M. Cooper, Professor of Anthropology at Catholic University. The problem of the role of social science, however, was frequently brought up by other witnesses, and was often included in the questions that members of the Senate Committees asked of witnesses.

1. Last spring at the direction of the Executive Committee, President Carl C. Taylor, of the American Sociological Society, appointed a committee of the Society, with himself as Chairman, to consider the relation of the Society to the Science Legislation then pending before Congress. This Committee met in New York in June. It was the unanimous opinion of the members that it was desirable that the membership of the Society should be as fully informed as possible about the issues involved in the legislation, and that the appropriate vehicle for this was an article in the **American Sociological Review.** The author, a member of the Committee, was therefore requested to undertake the writing of the article. The Committee cannot, however, be held responsible for the opinions expressed in the article, which are those for which the author alone bears responsibility.

After the hearings a compromise bill was worked out which on December 21 was introduced into the Senate (S-1720) under the sponsorship of Senators Kilgore, Johnson, Pepper, Fulbright and Saltonstall. Senator Magnuson, it will be noted, did not commit himself to this bill, but nevertheless it was a compromise in that the Kilgore group made a serious effort to take account of the views of the groups which had been supporting the Magnuson Bill. Though S-1720 did not abandon the plan of an administrator, it greatly strengthened the position of the Board, reducing it to nine members and empowering them to make recommendations directly to the President and Congress.

THE RIFT BETWEEN THE SCIENTIFIC GROUPS WIDENS

In the meantime the division outside Congress between the two principal groups became marked. A "Committee supporting the Bush Report" was organized with President Isaiah Bowman —himself a professional geographer— of Johns Hopkins University, as Chairman. This group wrote an open letter to President Truman urging him to support the Magnuson Bill.[5] To this the President replied saying in effect that he saw no reason to change the position he had taken in his message to Congress of September 5, which had been supplemented by two statements which were entered on the record of the hearings through the Director of War Mobilization and Reconversion and the Director of the Budget respectively.[6] In reply to the letter of the Committee supporting the Bush Report, there was organized, under the sponsorship of Dr. Harold Urey and Dr. Harlow Shapley as Co-chairmen, a "Committee for a National Science Foundation" which on Dec. 28 issued a statement, signed by over 200 prominent people from both the natural and the social sciences, which emphasized the basis for agreement and, without mentioning the bill as such, tended to throw support behind S-1720.[7]

During January, 1946, through the intervention of Senator Elbert Thomas of Utah, Chairman of the Military Affairs Committee, the various groups were brought together. As a result S-1720 was somewhat revised and agreement was reached on a bill which was introduced on February 21, 1946, as S-1850.[8] In particular this new version was approved by representatives of the Committee supporting the Bush Report, and became the final Senate version which was supported in the Senate by Senator Magnuson as well as the sponsors of S-1720. It was reported out of Committee in April and placed on the Senate calendar, but did not come up for action until July 1, when after brief debate it was passed, but with one major amendment, the deletion of the provision for a division of social science.

THE BREAKDOWN OF THE FINAL COMPROMISE

In the meantime another move was made from quite another quarter. On January 30, 1946, Senator Willis of Indiana, as spokesman for a group of Senators who had not been previously involved in the problems of science legislation, introduced S-1777, a bill to establish a National Science Foundation by setting up a corporation consisting of fifty members appointed by the President from nominees proposed by the National Academy of Sciences. This Foundation was, subject to the approval of Congress, to set up its own constitution and define its own scope. The final clause included an appropriation of $100,000 for the making of an "initial report and recommendation." In other words, all the work of Dr. Bush and his colleagues, and of the many others who had investigated the problem, was to be brushed aside in favor of another investigation. The Willis Bill failed of passage in the Senate by the narrowest of margins. Its introduction was indicative of the strength of forces which were suspicious of the whole idea of a Science Foundation.

Agreement between the most important interested groups on S-1850 seemed, however, to have been reached[9] and subject, of course, to the usual hazards of the legislative process, the outcome of its consideration was awaited with considerable confidence. The agreement did not, however, hold, and its breakdown was expressed by the introduction on May 15 in the House of Representatives of the Mills Bill (HR 6448). This bill was a very slightly revised replica of the old Magnuson Bill (S-1285). Hearings were very hastily arranged, with the witnesses dominated by members and proponents of the Committee supporting the Bush Report, with both Dr. Bowman and Dr. Bush himself expressing their preference for this over S-1850, in spite of their previous agreement that the latter presented a satisfactory solution of the problems presented by earlier versions. Proponents of S-1850 were not notified of the hearings in advance, and it was only through their own representations, notably those of Secretary Henry A. Wallace, that they were given an opportunity to be heard at all. The introduction of HR 6448 proved to be the fatal step which blocked action on the whole topic in the 79th Congress. It broke the united front of the principal interested groups in support of S-1850, both inside and outside Congress, which had been so painfully achieved. After the passage of S-1850 (as amended) by the Senate, a slightly modified HR 6448 was reported out by the Sub-committee on Public Health of the Committee on Interstate and Foreign Commerce to the full Committee. Here, on July 19, the Committee decided it did not have the information necessary for action and the whole subject was tabled, thus blocking any further action before a new session of Congress.

II

THE FACTORS UNDERLYING THE CONTROVERSY

What is the explanation of the failure of the Science Legislation just when the situation seemed so peculiarly favorable? How far did the attempt to include social science introduce the controversial issue which so split the advocates of the Foundation in general, that the whole cause was, for the time being, lost? To answer the second question first, the controversy over social science seems to have been a factor in deepening the general split, but not to have been a primary one. The primary difficulty centered on the organization of the Foundation and the provisions for the distribution of funds, the second one was the patent issue, and social science seems to have occupied third place.[10]

The division of opinion and attitude behind the controversy over these issues was probably primarily one within the ranks of the scientific groups concerned. But it got involved with general issues of national politics in such a way as to go far toward destroying the essentially non-partisan character of the legislation which most of its early advocates had hoped could be maintained, and sincerely believed was in fact justified.

The division within the scientific groups was most dramatically expressed in the letter to President Truman from the Committee to Support the Bush Report, and its list of signers, on the one hand, and the statement of the Committee for a National Science Foundation, organized by Professors Urey and Shapley, and its list of signers, on the other. Very broadly speaking, this was a division between an inner group which had played the leading role in the work of the Office of Scientific Research and Development during the war and were associated with the institutions where the bulk of that work had been done and, on the other hand, a much broader group of scientists all over the country.

WAR TIME TECHNOLOGY VS. PEACE-TIME SCIENTIFIC RESEARCH

The first group seemed to be above all concerned to preserve the control of the Foundation in the hands of highly qualified scientists who had proved their capacities in the field of war research. In turn this seemed to many to mean that

the bulk of research under the auspices of the Foundation would be concentrated in the rather small number of university and industrial research laboratories which had played the most prominent part in the work of OSRD, such as the Massachusetts Institute of Technology, Harvard, The University of Chicago, Columbia, The Bell Telephone Laboratories, and The General Electric Company Laboratories. The opposing point of view tended to be suspicious of too great a monopoly in the hands of a "scientific oligarchy" and of a privileged group of research institutions, both academic and industrial.

Without in any way depreciating the extraordinary achievements of OSRD research during the war, the tendency of the second group has been to argue that the form of organization it took, though extremely effective for the purposes of the war, should not serve as a precedent for peace-time conditions. In the latter context the base should be considerably broader both geographically and in terms of the groups and institutions involved. This could on the whole be more readily accomplished with an organization which was more responsive to the President and Congress than an almost wholly independent Board would be.

It can be said with considerable confidence that initially the group which has urged the "Bush Report" has neither been particularly concerned with any issues of national politics as such, besides concern for national defense and the general welfare, nor have they held any specific attitude of hostility to the social sciences. However, the situation has gradually taken shape in such a way as to involve both these connections; the "Bush" position has tended to become identified both with political conservatism, and with a desire to exclude the social sciences.

In addition to the natural feeling of a group of persons who have become accustomed to playing the central role in favor of their own kind continuing to do so, this tendency seems to have been associated with a particular relation of wartime research to industry. As a whole succession of the witnesses before the Senate Committees emphasized, wartime research was inevitably concentrated in the applied and engineering fields, not in those of fundamental science. It was a matter of devising, in the shortest time, specific means to attain specific ends, using fundamental scientific knowledge, of course, but not primarily concerned with adding to it. It was, in short, technological research, and the center of gravity of technological development as such naturally has lain in industry. A very prominent role was played by university laboratories in the program of war research. But at the same time the close liaison between industry and physical science which had developed in peacetime tended to be accentuated by the conditions of wartime research.

The financial resources available in industry for the support of research are enormous. For this and other reasons it is not surprising to find that a certain group identified with industry has been skeptical of any proposals to bring the Federal Government into the field of scientific research at all, because they felt the resources at the command of industry were quite adequate, and because they were fearful of any possibility of "government control."[11]

Given the very close relationship between industry and scientific research during the war, and given the general suspicion in industrial circles of any extension of the functions of the federal government it is not surprising, first, that opposition to the whole idea of a National Science Foundation should appear. In effect the introduction of the Willis Bill, and the support it received in the Senate, had this significance. Secondly, it is not surprising that the general weight of industrial influence should, short of virtually blocking any action at all, have been thrown in favor of a program which contained the most elaborate safeguards against "political" influence, by vesting control in the hands of a group of men altogether outside the regular structure of government, and by ensuring that there should be no change in traditional policy with respect to patents. It seems to have been in this way that the interests of an inner group of the wartime "statesmen of science" and of prominent elements of politically influential "big business" have come to coincide, with the effect of turning the problem of the Foundation to a considerable extent into a partisan issue.

In the later stages of the consideration of the problems, in particular this aspect of the situation appears to have become formally crystallized by the direct intervention of the National Association of Manufacturers as a lobbying organization in favor of the Mills Bill, the introduction of which was the primary factor in breaking the united front of the scientific groups in favor of S-1850. The situation was also reflected in the character of the Senate vote on the amended bill, in which the opposition was by a considerable majority Republican, though a number opposed the Hart amendment[12] while a solid bloc of Democrats favored it. This drift of the issue can only be felt to be highly unfortunate by all the scientific groups, natural or social, who rightly feel that the fundamental orientation of their fields of knowledge, and its potential significance to the welfare of the nation, are altogether above and beyond the immediate political issues of the day.

[2] Three other bills, the Byrd and Fulbright Bills in the Senate and the May Bill in the House, were much more limited in scope. In order not to complicate the exposition unduly, these bills have been omitted from consideration in the following discussion.

[3] Undoubtedly as a matter of deliberate policy.

[3] **Hearings on Science Legislation** (S-1297 and Related Bills) Parts 1-5. Government Printing Office, 1946.

[5] For the text of the letter and the list of signees see **Science**, Nov. 30, 1945.

[6] **Science**, Jan. 4, 1946. **Science**, since it was taken over officially by the AAAS on Jan. 1, 1946, has carried a full running account of developments in connection with the Science Legislation.

[7] For the text of the statement see **Science**, Jan. 4, 1946, and for the list of signers the issue of Jan. 11, 1946.

[8] See the summary of events up to this point by Dr. Howard A. Meyerhoff, **Science**, March 1, 1946. S-1850 provided for a Division of Social Sciences. It did, however, qualify the authority of this division by stating (p. 3, l. 16ff.): "The functions of each division shall be prescribed by the Administrator after receiving the advice of the Board except that until the Administrator and the Board have received general recommendations from the Division of Social Sciences regarding the support of research through that Division, support of social science research shall be limited to studies of the impact of scientific discovery on the general welfare and studies required in connection with other projects supported by the Foundation." Dr. Meyerhoff (**Science**, June 21, 1946) states that this limitation was inserted at the insistence of representatives of the Committee Supporting the Bush Report.

[9] The most important evidence of the generality of this agreement lies in the vote of the Council of the American Association for the Advancement of Science, the most representative single body in the field. This vote, in support of S-1850 was by the overwhelming majority of 233 to 10. On its basis Dr. James B. Conant, President of the AAAS, wrote a letter to all members of the Senate urging in the name of the Association that the bill be passed (**Science**, May 10, 1946).

[10] It is a mistake to suppose, as some have done, that natural scientists were virtually united in opposition to the inclusion of social science in the Foundation. Besides the testimony in the Hearings of a number of prominent scientists, including Dr. Shapley and Dr. Conant (See **Hearings**, Part I, p. 51, Part 5, p. 984), the most important evidence is in the poll taken by the AAAS of its membership in which 67% favored government support of research in the Social Sciences (**Hearings**, Part I pp. 84ff, testimony of Dr. Meyerhoff).

[11] See especially the testimony of Dr. Frank B. Jewett, former Director of the Bell Telephone Laboratories. (**Hearings**, Part 2, pp. 427 ff.). The fact that, at this critical time, Dr. Jewett has been President of the National Academy of Sciences, has been a factor of considerable significance in weakening united support for the science legislation on any basis on which general agreement could be reached. In the hearings Dr. Jewett's testimony took a position not shared by any other prominent witness. It is difficult to tell how widely it is shared by other scientists associated with scientific research in industry.

[12] Which eliminated the Division of Social Sciences.

The Army's Research Program . . .

. . . . . .

Maj. Gen. H. S. Aurand

The continuance and improvement of laboratories for scientific research is of primary interest and concern to the War Department. Our program is, and must continue to be, one for preparedness; and it is your job and mine to see to it that we do not lag behind any possible enemy either in nuclear physics or in any other field of research and engineering of importance in the defense of the nation.

THE JOINT RESEARCH AND DEVELOPMENT BOARD

To assist in maintaining existing contacts and making new ones, as well as to assure co-ordination between the War and Navy Departments, the respective Secretaries have set up the **Joint Research and Development Board.** In its charter they not only gave it a "blank check" of authority but also, and more important, they obtained the services of the former head of the Office of Scientific Research and Development as its chairman—Dr. Vannevar Bush. This is a five-member board, including the chairman. The Navy members are Assistant Secretary Kenney and Admiral Ramsey; the Army members, Generals Spaatz, commanding the Air Forces, and Devers, the Ground Forces.

One of the permanent committees of the Joint Research and Development Board is the Atomic Energy Committee. The Army membership of this committee, which is now under consideration, will also link the Army with whatever agency for the development and control of atomic energy Congress may create.

Our program provides for progress in research and engineering for guided missiles, radar, biological warfare, and other modern tools of warfare. That the War Department means business in this matter is amply demonstrated by the creation at the highest staff level of a directorate for research and development. To see where this organization fits in the research and development picture, recall that on the national, or **presidential** level, there will be the Atomic Energy Commission and the National Science Foundation. In addition to many existing governmental organizations on the **cabinet** level, such as the National Advisory Committee for Aeronautics and Bureau of Standards, there is, and will continue to be, the Joint Research and Development Board created by the Secretaries of War and Navy. Within the War Department, at the **Chief-of-Staff** level, is the Directorate for Research and Development. The director reports directly to the Chief of Staff and Secretary of War. Within the War Department it initiates, allocates, co-ordinates, supervises, and assures the progress of research and development projects. But perhaps more important than its internal duties are those in connection with contact with the civilian scientists and engineers of the nation.

In June, when he established this directorate, General Eisenhower announced the War Department research and development policy. Doctor Bush felt that the new policy augured so well for the future that he sent a copy of the announced policy to each of the scientists and engineers who had been associated with him during World War II, together with a request that each co-operate during peace in the new program as they had done so well during war in the old one.

GEN. EISENHOWER'S POLICY STATEMENT

Here are some excerpts from General Eisenhower's policy memorandum:

"The future security of the nation demands that all those civilian resources which by conversion or redirection constitute our main support in time of emergency be associated closely with the activities of the Army in time of peace.

"The lessons of the last war are clear. The armed forces could not have won the war alone, scientists and businessmen contributed techniques and weapons which enabled us to outwit and overwhelm the enemy . . . This pattern of integration must be translated into a peacetime counterpart which will not merely familiarize the Army with the progress made in science and industry, but draw into our planning for national security all the civilian resources which can contribute to the defense of the country."

General Eisenhower listed five policies to be put into effect to achieve these ends.

The **first** policy is: "The Army must have civilian assistance in military planning as well as for the production of weapons." At the moment, two actions are being taken to put this policy into effect. One is the creation of a **War Department Civilian Panel** of outstanding scientists and engineers. Both the natural and social sciences will be embraced in this panel. The other is the creation of a **Strategic Committee** of the Joint Research and Development Board.

The **second** policy is: "Scientists and industrialists must be given the greatest freedom to carry out their research." In so far as this applies to the attitude of Army personnel, the Research and Development Divisions will police the policy. More concretely, the policy will apply to contractural relationship between the Army and the universities, industries, and foundations conducting research and engineering for it. Within the limits of present laws governing government contracts, all possible freedom will be given. But something more is necessary to implement this policy. That is a change in the contract law to permit the full freedom of the scientists and engineers envisaged by this policy. Both the Army and Navy have urged the Congress to make such change, and bills for the purpose have been introduced.

The **third** policy is: "The possibility of utilizing some of our industrial and technological resources as organic parts of our military structure in time of emergency should be carefully examined." At the moment the implementation of this policy is in the purely planning stage. The assistance of the War Department Civilian Panel is badly needed in connection with this policy.

The **fourth** policy is: "Within the Army we must separate responsibility for research and development from the functions of procurement and distribution." This policy has been put into effect by the establishment of the Research and Development Division on the same level as the Service, Supply, and Procurement Division of the General Staff.

The **fifth** policy is: "Officers of all arms and services must become fully aware of the advantages which the Army can derive from the close integration of civilian talent with military plans and developments." The implementation of this policy is an intra-Army affair. It can be brought about primarily by the indoctrination of Army personnel.

General Eisenhower's final paragraph stated:

"In the interest of cultivating to the utmost the integration of civilian and military resources and of securing the most effective unified direction of our research and development activities, this responsibility is being consolidated in a separate division on the highest War Department level. The Director of this Division will be directly supported by one or more civilians, thus insuring full confidence of both the military and the civilian in this undertaking. By the rotation of civilian specialists in this capacity we should have the benefit of broad guidance and should be able to furnish science and industry with a first-hand understanding of our problems and objectives. By developing the policies outlined above under the leadership of the Director of Research and Development, the Army will demonstrate the value it places upon science and technology and further the integration of civilian and military resources."

From a speech delivered in Los Angeles on July 26, 1946.

Science Dons a Uniform . . . . . from Business Week

Under the above title BUSINESS WEEK *(Sept. 14) presents a remarkably frank—not to say cynical—appraisal of the current situation in American science. We here quote some interesting excerpts from this article.*

Partly by design, partly by default, federal support of pure science is today almost completely under military control. Its general direction is being set by military needs; its finances are coming from military funds. The odds are getting better all the time that pure scientific research will become, permanently, a branch of the military establishment.

Expenditures for research in pure science, in 1938, totaled less than $40 million. The bulk of these $40,000,000 came from industry: the financial backbone of university research was endowments and foundation grants that wore an industry coloration because of their basis in gifts from industrial fortunes.

The war changed all that. The university and foundation research laboratories were drafted into military work and the research scientists with them. The universities were converted into industrial-type laboratories concentrating on weapon development rather than basic discovery. Even the atom bomb project, abstruse as it looks, was primarily an engineering problem by the time the government picked it up.

Quite early in the war the hope arose that immense postwar benefits could be achieved, particularly in industry and medicine, if something of the wartime scope and coordination of research could be continued. Back in 1944 President Roosevelt asked Dr. Vannevar Bush, director of OSRD, to prepare a postwar plan for federal financing of science.

The main principle was soon caught in a crossfire of contending parties. There were three controversial issues: (1) the degree of centralized government control over the program; (2) the handling of commercial benefits emerging from government sponsored research; and (3) to a lesser extent, the inclusion of the social as well as of the physical sciences.

The New Dealers, labor spokesmen, and most government people concerned with science wanted to treat the research foundation as an ordinary instrument of government. They stressed the advantages of coordination and argued for a single full-time administrator. And they plumped for a general policy of dedicating all of the research results to the public.

The universities were queasy. They wanted the money, but they feared government domination of their research programs. They preferred, as the Bush report recommended, to keep the foundation a quasi-governmental affair administered by a board of scientists who would serve part time.

Businessmen were bothered by the proposed no-patent policy. They suspected that in reformists' hands the foundation program would soon undermine the whole patent system, long a favorite object of New Deal attack. For the same reason, most businessmen preferred the loose board set-up to a more centralized system.

Conservative congressmen freely predicted that federal support of the social sciences would degenerate into a program of radical propaganda. The more conservative House Commerce Committee sat on the bill long enough to prevent House action.

In the absence of any civilian program for science, the military moved in—the Navy about a year ago, the army in recent months.

Just before the end of the war, the Navy tackled this problem by setting up the Office of Research and Inventions. This year permanent legislative authorization for the agency and for the loose negotiated type of contract it uses was obtained, and ORI was reorganized as the Office of Naval Research (ONR).

As one university after another was released from its wartime OSRD and Manhattan District contracts, the Navy stepped in and arranged financing. By July, it had arranged to spend about $10,000,000. For the coming year, ONR has $45,000,000 of which about $11,000,000 will be spent at naval laboratories, about $7,000,000 for basic work in industrial laboratories, and about $26,000,000 at universities.

The financing mechanism is a loose form of nonprofit research contracts. Sometimes ONR arranges for investigation of a particular subject, but ordinarily a college or other research group works up a program of investigation it would like to pursue and brings it to the Navy. If ONR can see some possibility of ultimate results having military value, and if it thinks the institution has the men and the equipment to do the job, it will contract to support the program.

The typical contract is on the cost-plus-nothing basis covering salaries and a percentage of institutional overhead worked out by Navy auditors. ONR fights shy of financing buildings, but it will pay for elaborate equipment provided this is theoretically movable so that the Navy can keep title.

The Navy people are sophisticated and enlightened. Realizing that original research cannot be regimented, they are consciously trying to maintain a civilian feel in their outfit and to operate in much the same way that a national foundation would. But, necessarily, in approving projects they're looking for a military application, even though a remote one.

The pattern of research which this produces is suggested by the first year's contracts. About 40% of these are for studies in nuclear physics, as might be expected. Electronics is next, with 14%, while medicine and fundamental studies in the problems of guided missiles each account for a little over 10%.

The Army has been slower than the Navy in getting into basic studies, but it is moving into the field now and it packs the big bankroll. The Army research budget this year is about $280,000,000, but the largest part of this will be spent on development work at Army centers and through industrial development contracts. However, about $70,000,000 is earmarked for fundamental studies at universities.

To coordinate the two programs, a Joint Research and Development Board has been created. The board consists of four high-ranking officers, with Dr. Bush as civilian chairman. Chances are that the board's initial approach will not be allocation of subject matter between the services so much as allocation of institutions and personnel—permitting the Army to contract with certain research groups, the Navy with others.

The prospects for a civilian foundation are uncertain and becoming more so all the time. The question will certainly come up in the next Congress. But the mere fact that a research program is already going forward to the tune of $100,000,000 a year, even though under military auspices, will take away much of the urgency of the foundation proposal.

Particularly in the light of Navy patent policy, some businessmen may prefer the risk of the militarization of science to the creation of an agency they suspect of ideological motives.

And even though many scientists deplore the warping of the direction of research inevitable in a military program, some of the university people—with their fields well-established, their file of telephone numbers organized, and the money flowing freely—may hesitate to upset a going operation.

The Role of Large Laboratories in Nuclear Research

Lee A. DuBridge

I think I should start out by warning anyone who is expecting definite answers to the many questions concerning the place large laboratories are going to play in physics research, that he will be disappointed. My objective will be to ask questions more than to answer them.

In the past, basic research in physics has been carried on primarily in small laboratories. A research worker with a few assistants was the fundamental unit. It is true that in the larger universities and some industries, a number of these research units were assembled under one roof and under one department chairman. The units themselves, however, were reasonably independent, though the stimulation brought about by many units working near each other was of the greatest importance.

Now there were individual cases, of course, usually under the leadership of a great research figure such as a Rutherford or a Kammerlingh Onnes where the individual research units combined efforts in a cooperative attack on some major problem or field. Some of these were, of course, eminently successful. Even in them, however, independence of the individual units was the rule. Each unit built up its own equipment and facilities. In some instances, the units shared some major piece of equipment with others—such as in the famous Leyden cryogenic laboratory.

Such was the picture before 1930 in basic physics, even the basic physics carried on in industrial laboratories.

In applied science, the situation was quite different. Here in many large industrial laboratories, concentrated cooperative attacks on important problems had been organized with conspicuous success. The various aspects of the problem were parcelled out to specialized groups, each of which was responsible for the development required to bring its unit in line with the whole.

The beginnings of a change in the organization of basic science laboratories began with the development and perfection of the cyclotron as a research tool. Here was a major piece of equipment which could keep many individual research units busy. Several problems could be carried on in parallel—and the combined efforts of all groups were needed to keep the machine in operation and to carry on continued improvements. In a sense then, the "large" laboratory of the sort I am referring to today, began with the Radiation Laboratory of the University of California. Other smaller groups, built on a similar pattern, grew up in other parts of the country and cooperative research had become a reality by the time the war broke out.

A speech delivered at the Bicentennial Celebration of Princeton University.

THE HUGE WAR LABORATORIES, A SPECIAL CASE

The war, of course, brought about the greatest flowering of large cooperative laboratories in history. Laboratories numbering many hundreds or even thousands of employees grew up for the development of radar, proximity fuses, nuclear energy and other fields. Their achievements were so astounding that they at once raised the question of why peacetime research could not be carried out in the same way. This is the question which I would like to examine in more detail. There is danger of misreading the lessons taught by the war—but there is also the danger of not reading these lessons at all.

In the first place, it is necessary to emphasize the fact with which you are all familiar that these huge war laboratories were not research laboratories in the sense that they carried on research in pure physics. They were applied physics laboratories—they were built and organized to develop specific weapons of war. The basic research which paves the way had been done before the war. The tools were for the most part at hand—they had only to be put into usable form. True, many basic problems had to be examined or re-examined. Many a good Physical Review paper could have been published had security restrictions allowed. But these researches were for the most part incidental to the task of developing a weapon. These laboratories followed in many respects, the patterns which had already been set by the industrial laboratories in attacking applied problems. But they went further in size and in the degree and specialization of the groups—and in the number of physicists employed.

We cannot, however, conclude that because these laboratories succeeded in their technological job, they could also be adapted to the problems of basic research. Nor can we conclude that they can't be.

A second feature of these laboratories was that they were built up under conditions peculiar to a war—conditions which cannot possibly be reproduced in full in time of peace. During the war it was possible to drain the colleges and universities of scientists to man the laboratories. This produced serious enough results during war—it would be impossible and disastrous in time of peace. Nevertheless, more scientists can be trained; so the availability of enough scientists need be no permanent or insurmountable obstacle to large laboratories if they are needed.

Still more important—in fact the dominating feature in any laboratory problem—is the attitude of the scientists themselves. During the war they were willing to live and work under necessarily unsatisfactory conditions. They were willing to be regimented (at least most of them were) for the common good. They were willing to engage in all sorts of tasks—tedious and uninteresting ones, field work—even administrative work—which were far afield from their interests as research workers. In short they were willing to give up the most cherished privileges normally associated with scientific work—independence and freedom. They were not only willing but anxious to give up these things because the incentives were so overpowering. The opportunity of helping in a significant way to win the war reduced all other considerations to insignificance. I believe no other objective, no matter how fine it might be, can provide the tremendous emotional stimulus to collaborative effort which the war supplied. Without this stimulus, any laboratory built along lines of the great war laboratories, is bound to collapse—just as every single war laboratory has collapsed—whether it wished to or not—soon after the war ended.

Our lesson from the war experience then, is that great laboratories can be successful, in the field of applied science, in time of war. One can safely predict that any attempt to keep going into peacetime a laboratory built up during the war for war purposes is doomed to failure—whether it be operated under civilian or military control. If great laboratories are needed in time of peace, they must be built for peacetime conditions.

THE NEED FOR LARGE PEACETIME RESEARCH CENTERS

The first question then is whether—in the field of basic science—there is a need for something more than the individual laboratory of pre-war days. Let me emphasize again the word basic science. I am not talking about applied science—about industrial laboratories or about military laboratories for defense purposes. There is no doubt a need for such laboratories—they can be successful if conditions are right. What these conditions are, I will come to in a moment.

But let us now ask whether in the field of nuclear physics, there are reasons for establishing large laboratories. I believe there are—and the reason is simple. Some

of the facilities required for modern work in nuclear physics are so large and so expensive that a large staff is required to operate and make full use of them, and only a few such major facilities can be built in this country.

Now I have no doubt that small nuclear reactors and small or medium sized accelerators will some day be found in almost every well-equipped physics research laboratory—in universities, some industries and research foundations. But the huge, high-power pile, the billion-volt accelerator will for some years to come, be found only in a few places. And it will be poor economy to build such facilities and not have available the large research and technical staff required to use them to full capacity. And it will be equally tragic if such facilities are not open to use by physicists throughout the country. I believe it is inevitable that a few great research centers will grow up—that they will be of greatest importance in the advance of nuclear physics.

METHODS OF ORGANIZATION

If they are inevitable, the question is how can they be built and organized for maximum effectiveness.

Such laboratories might be sponsored and managed either by a single university, by an industrial corporation, a government agency or an independent non-profit corporation organized for the purpose.

I think it will be evident to this group that neither an industry nor a government agency is suited to manage a laboratory built largely for basic research. Industry must ultimately seek a practical goal—government or military agencies are not set up to operate basic research.

There is no doubt that any one of a dozen major universities or engineering schools could operate a major nuclear physics center. The University of California at Berkeley is now doing it. The commanding position of this University on the Pacific Coast, the eminence of Dr. Lawrence and his staff of the Radiation Laboratory, the warm welcome which visitors and workers from other institutions have always had, assures the success of this great center. This Laboratory satisfies all the conditions which we shall name presently.

But Berkeley is in a unique position—in more ways than one. It is unlikely that the pattern established there can be followed elsewhere in the country. In the East, there are many great institutions within easy reach of each other. Since it must be government funds which finance such a laboratory, it will be difficult to pick one institution to operate it—and even then, full use by other groups is not easy to insure. At any rate, in two cases—Chicago and the Northeast—the universities themselves have preferred cooperative management. So the question of the place and success of large cooperative laboratories will soon have an experimental answer.

PROBLEMS OF THE LARGE RESEARCH LABORATORY

Without presuming to tell these laboratories how they should set themselves up, it may still be worthwhile to set forth some of the conditions which any such laboratory must meet to avoid known pitfalls.

These conditions are not easy to state concisely, but at the risk of being misunderstood, I will risk a few remarks about them. (Let me call your attention to the fact that I am no authority on this subject—for as I have pointed out—experience in a war laboratory is largely inapplicable. I am only stating the feelings which I think any physicist would have).

As to facilities, it should be clear that independent laboratories will have as their major facilities only those very large installations which, as far as can be foreseen, are beyond what a single university could contemplate operating—or which, because of shortage of material or funds, not more than one or two universities in any area could have. Such laboratories should not compete with or duplicate or take the place of strong university physics departments. Rather—like a 200 inch telescope—they should provide for use by many people, facilities of an extraordinary type.

As to location, there are many difficult problems to be met. Physical facilities such as power, water, isolation to avoid radiation dangers, etc. must all be considered. But less tangible elements may be even more important. To attract a permanent staff, they must provide a satisfactory place to live. This means convenience to a metropolitan area with its housing, shopping, educational and cultural advantages. Desert isolation is no drawing card for most physicists. Living conditions must be positively attractive if the highest quality temporary or permanent staff is to be drawn in.

Location near one or more strong universities is also important. Nothing can replace the close ties to the atmosphere, libraries, contacts with students and other scientific companionship and other attributes of a university. What geographical separation is necessary can be partially bridged by official university connections so that ties with the academic world are real.

As to personnel, it is evident that the establishment must not only have an adequate maintenance, technical, clerical and engineering staff, but also a permanent or semi-permanent scientific staff of high quality supervising its general program. And this permanent staff must attract and welcome other workers who come in for short or long periods. The Laboratory should offer opportunities for many young men to come in on post-doctorate fellowships to complete their training and acquire research experience. One of its important contributions to physics will be its contribution to more adequate training of young men.

As to the program, the permanent staff will need to map out the general important lines of effort. But the program must be flexible enough to make room for new ideas and new lines of attack which either the permanent or visiting staff wish to carry out. War time regimentation can have no part in a successful basic research establishment.

All of these are obvious statements. But they are no less important for that; for the obvious is frequently most easily overlooked. And furthermore, these are conditions which can readily be met by intelligent management. And if progress in nuclear physics is important to the nation, to the world—and to science itself—it is important that they must be met. The cognizant government and military agencies must recognize that these are not whims of crazy scientists but are part of the necessary fabric of the atmosphere in which science flourishes.

That these new laboratories will face grave difficulties, no one questions. They may not succeed. For the next few years the shortage of scientific personnel may prevent their adequate development or slow it down. There are not enough physicists at the present moment to man all our current ambitious programs. But our physics departments are all but clogged with ambitious and able graduate students. They will soon be flowing out to fill many a critical gap. They will step into opportunities which we middle-aged gentry would have longed for twenty years ago. We all witnessed what young men could do during the war. They will do it again.

So, I, for one, look forward with keen interest to a great new experiment in physics research. Those who long for the old days with the lone worker in the basement room with his wax and string and glassblowing torch can have them. I believe that the essential spirit of the old days—freedom of inquiry, time for thought—can be obtained even in the pressure of great new physical and organizational techniques. I shall leave it to the fortunate leaders of these great new establishments to justify our optimism.

The Manhattan Project Declassification Program

. . . . . Lt. Col. W. S. Hutchinson

There exists considerable confusion concerning the publication of the scientific results amassed within the Manhattan Project. In the belief that a public release, at this time, by declassification authorities might clarify the situation we requested an article on the subject for the BULLETIN OF THE ATOMIC SCIENTISTS. *The following report by Lt. Col. Hutchinson, Declassification Officer for the Manhattan Engineer District, was prepared in response to this request.*

American science is best served by the widest possible dissemination of scientific information without restriction. American national security is best served by controlling certain scientific developments in the nuclear field as they relate to the atomic bomb.

The Manhattan Project has worked out a very effective program which protects the vital secrets of nuclear science affecting national security and which still releases the basic mathematics, chemistry and physics developed on the Project during the war. One purpose of this policy is to give impetus for American science to continue its advance, not only in government sponsored and government controlled laboratories, but also in the many independent academic and industrial organizations that are the foundation of our national scientific, engineering, and industrial strength.

The first application of this policy was the release of the Smyth Report,[1] shortly after the announcement of the bombing of Hiroshima. This was written for the substantial group of engineers and scientific men "who can understand such things and who can explain the potentialities of atomic bombs to their fellow citizens. The present report is written for this professional group and is a matter-of-fact, general account of work in the United States since 1939 aimed at the production of such bombs." In accomplishing this purpose a general survey of the major fundamental developments was presented to American scientists while the detailed information which concerns national security was retained.

Continuing the fundamental policy outlined above, General Groves appointed a Committee on Declassification, composed of the senior scientists in the country, in the fall of 1945. Dr. Richard C. Tolman, Dean of the Graduate School, California Institute of Technology and now chief scientific advisor to Mr. Bernard Baruch, was the chairman. Colonel John R. Ruhoff of the Manhattan District was the non-voting secretary. Dr. R. F. Bacher, Dr. A. H. Compton, Dr. E. O. Lawrence, Dr. J. R. Oppenheimer, Dr. F. H. Spedding, and Dr. H. C. Urey comprised the committee. The purpose was to recommend the adoption of a detailed procedure to accomplish the general mission of releasing scientific information to further the national welfare where this can be done without danger to the national security.

The first report of this committee was submitted during the latter part of 1945. It was reviewed by General Groves and finally approved by the highest governmental authority in March 1946.

The general trend of this report provided for the establishment of a declassification organization project—wide in scope and manned by the very civilian scientists who have been personally concerned with developing the information that was to be presented for release. Declassification was to be accomplished by **document** rather than by broad fields of science. That is, each release had to be written up and carefully reviewed in detail, first by the head of the organization in which the information was developed (called a "Coordinating Organization Director"), than by a competent scientist in the particular subject concerned (called a "Responsible Reviewer"), and finally by the Manhattan District Declassification and Publications Office at Oak Ridge to check for any possible clerical slips and to provide general administration for the organization as a whole. Actual declassification was to be accomplished when these reviews clearly indicated that the information in the document fell in the category of safely releasable material as defined in a Declassification Guide which was prepared by the committee.

The present Manhattan Project declassification organization began to operate along these lines in April 1946. With a few modifications it is now doing a flourishing business and had declassified more than four hundred scientific and technical documents by the end of September without releasing any information that endangers the National Security.

The precise details of the operation of this organization are outlined in **Manual for Declassification of Scientific and Technical Matters** dated 1 May 1946, which is available in Manhattan District, area Engineer Offices and in the offices of Coordinating Organization Directors and Responsible Reviewers, for examination by authors who wish to prepare documents for declassification.

The attached chart is taken from this manual. It shows the routing and distribution of the six copies of each document submitted and generally indicates the channels available to authors who wish to have their papers submitted for release.

The Declassification Guide prepared by the Committee on Declassification provides in general for the release of basic scientific information which bears no direct relation to the problems that a foreign nation would have in making an atomic bomb of its own. An example in physics is a paper entitled "On the Disintegration of Nitrogen by Fast Neutrons" by H. H. Barschall and M. E. Battat. The Bibliography of Scientific and Industrial Reports of the Department of Commerce abstracts this paper as follows: "A description is given of an experiment using a source of monoenergetic neptrons of variable energy to measure the disintegration cross section as a function of neutron energy. The cross sections of the N(n,p)C and N(n,α)B reactions were measured for neutrons of energies between 0.2 and 1.7 Mev. Resonances were observed for neutron energies of 0.55, 0.70 and 1.45 Mev. Curves are appended. This paper is released through the Physical Review." An example in chemistry is a paper entitled, "Radio Chemistry and the Fission Products" by Charles D. Coryell. The abstract of this paper is too long to repeat. However, the general subject matter is indicated by the title. A considerable expansion of the information in this

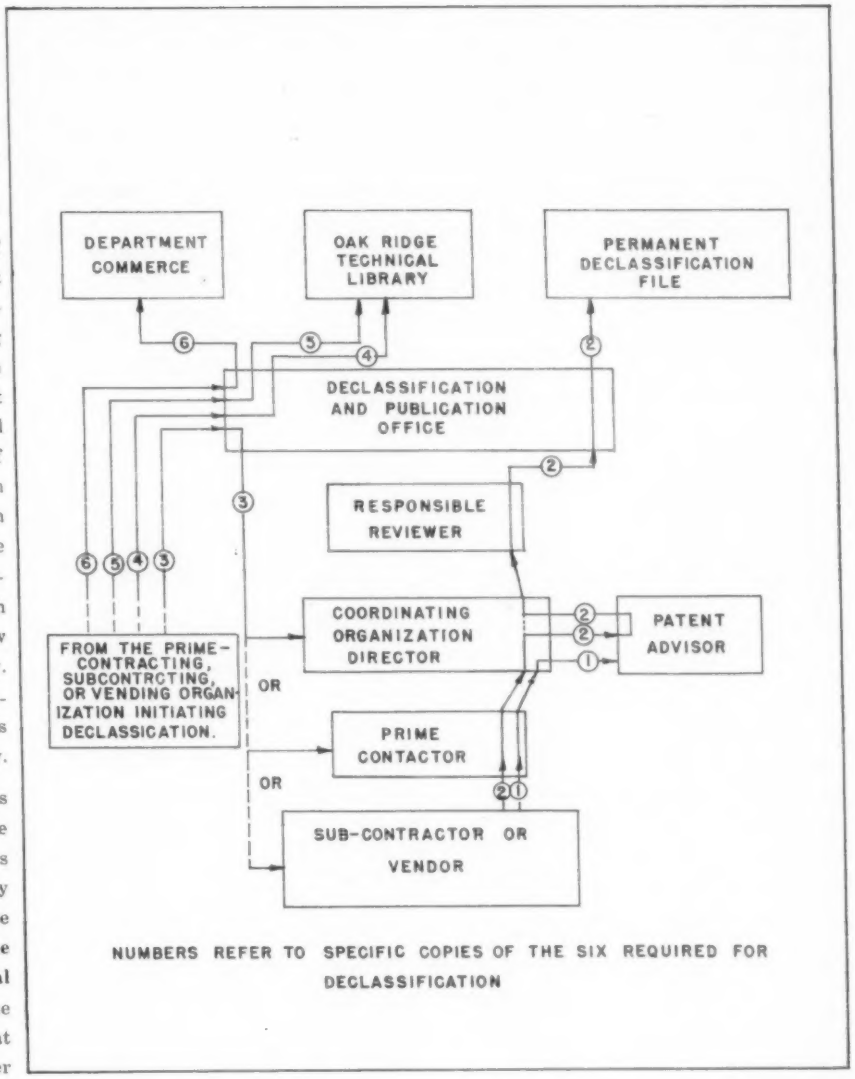
1. Atomic Energy for Military Purposes, H. D. Smyth.

field has been declassified and is scheduled for early publication in the Journal of the American Chemical Society. The title of this new paper is "Survey of the Fission Product Isotopes" to be issued by the Plutonium Project. This Survey was prepared by J. M. Siegel, based partly on previous ones circulated on the Plutonium Project prepared by Coryell, Brady, Turkevich, Wineberg, Sugarman, Glendenin, Siegal, Seaborg, and Kohman based on the unclassified general tables of Seaborg.

Specific evidence of the effectiveness of this declassification policy was given at the June Meeting of the American Physical Society and at the September Meeting of the American Chemical Society in Chicago. Of the 101 papers presented at the Physical Society Meeting, from all domestic sources, 46 were the product of the Manhattan Project Declassification Organization. Included in American Chemical Society papers was a complete two and one-half day symposium on fluorine and fluorocarbon chemistry which heralds the birth of a complete new branch of the domestic chemical industry. This represents a very considerable contribution to American Science and was done without danger to national security.

Despite the carefully repeated checks that are made on each document, the system operates quite rapidly on papers that are clearly in the releasable category and which are submitted in accordance with the directions in the **Manual for the Declassification of Scientific and Technical Matters.** A prominent scientist at the June Physical Society meeting said that it was remarkable that not a single paper that was submitted for declassification and presentation at this meeting had to be withheld from presentation because of administrative failure of the Declassification Office at Oak Ridge. Normally a document can be processed within two weeks from the day that it leaves the Coordinating Organization Director's office.

An Army officer recently described the value of this declassification organization to the national welfare by the following illustration: "This war was won by teamwork and the two and one-half ton six wheel drive truck. That makes the cargo truck a military weapon. Suppose that after World War I the government had declared that all future research directed toward improving cargo trucks was to be conducted in strictest secrecy. If this had been done, maybe we wouldn't have had such a good cargo truck by the time World War II came around. In science the more contributors there are, the more progress will be made. We can't release everything concerning the atomic bomb, but we can release a lot of valuable information that will help American science to advance from here, particularly in applying wartime developments to peacetime use." Thus the Manhattan Project is furthering the national welfare by releasing scientific information where this can be done without danger to the national security.



The United Nations and Atomic Energy

The month of October has brought only slow development in the UN Atomic Energy Commission. Towards the end of the month, the spotlight shifted to the UN Assembly, where the subject of atomic energy kept creeping into all the most important pronouncements.

The September controversy over the American control plan had some repercussions in October in the form of speeches and statements by Baruch, Hancock, and Wallace.

UN Atomic Energy Commission

September ended on a hopeful note with the unanimous adoption of the report of the Scientific and Technical Subcommittee (See Bulletin of October 1). This report was submitted to the "Committee 2" (which is the political committee). The latter met on October 2, with the Chinese representative C. L. Hsia in the chair. In a review of the preceding developments, Hsia stated:

"The Scientific and Technical Committee which began its work on July 19 held 20 meetings. Here discussion was shifted from a debate concerning policy to an examination of the Technical and Scientific aspects of atomic energy. The focus of discussion was different and the method of work was different. The object was not that of stating national policies but rather the discovery of the relevant scientific facts that could be unanimously accepted by a group of scientists. All political implications of the problem of control were excluded. The committee worked together closely and intensively in the preparation of a document upon which they could all agree. The activities of this committee have significance for the work of the commission from both a substantive and a procedural viewpoint. The committee has produced a document containing important statements of facts and they have demonstrated a method of work that might be applicable in subsequent phases of our work."

The report* was then presented by **Prof. Kramers** (Holland). Prof. Kramers emphasized that from the technical point of view the Scientific and Technical Committee did not see any objections to control over atomic energy. He pointed out that while the question whether effective control over atomic energy was possible was a political question, the Scientific and Technical Committee had considered it useful to analyze what the committee called "Elements of Control", an analysis contained in Chapters 3 and 4 of the report. Prof. Kramers stressed that the report was the result of collaboration in the full sense of the word. To scientists, he said, the limitation of information at the disposal of the committee was far from agreeable. However, the possibility to speak frankly in informal meetings had been of very great importance.

Capt. Alberto (Brazil) in praising the work of the Subcommittee, said:

"In all justice I wish to particularly emphasize the wonderful attitude of the American scientists. As far as we were concerned, our role was often to ask questions, sometimes rather indiscreet questions but for the American scientists —Prof. Tolman, Prof. Oppenheimer, as well as Dr. Bacher, Dr. Fine, and Mr. Volpe, who are among those who share the military secrets of their country—the situation is delicate and difficult. Notwithstanding, and deserving of our highest admiration, they furnished us information in keeping with the standard of truthfulness among real men of science, and all this within the limits imposed by their duty to their country."

Dr. Nervo (Mexico) pointed out that the report established the close connection between peaceful and warlike activities in the field of atomic energy. He made the suggestion that the isotope separation plant and primary reactors, which he understood to be the dangerous large scale establishments, be prohibited in individual countries, and managed instead by an international organization in a special zone under international jurisdiction. The nuclear power plant, which he thinks are more difficult to use for diversion, could be established under national auspices, subject to international control.

Prof. Kramers promised a consideration of the proposal.

General McNaughton (Canada) said: "I would suggest that Committee 2 should now develop the examination of the problem of control to a further stage by following the method which has proven so successful in the Scientific and Technical Committee. Thus we might seek, through informal or semi-formal discussion, to add to our understanding of the problem. I suggest that this next stage in our work would not involve a decision on any particular system of control."

Mr. Parodi (France) supported the suggestion that Committee 2 should stay as long as possible on the technical level, and delay the consideration of political and legal problems to a later stage of its deliberations. Further data could be collected in all countries on the systems of control operating in comparable industries, like gold mining, diamond mines, electricity, etc.

Mr. Gromyko (USSR) said he would like to have some time to study, not only the report but also the Canadian Draft Resolution, the questions raised by the Representative of Mexico, the observations of Professor Kramers, and the statement of the Representative of France.

* * *

The Scientific and Technical Subcommittee met on October 17 to consider Dr. Nervo's suggestion. It was pointed out by Kramers that the question of the establishment of an international zone where nuclear fuel production should be permitted, is a political one and as such outside the scope of the Subcommittee. It was decided that Dr. Kramers would give Committee 2 a personal opinion on the subject after consultation with other members of the Subcommittee.

* * *

On October 18, Committee 2 met and Prof. Kramers made a statement which said in part:

Dr. Nervo had drawn attention to the circumstances, that in those peaceful activities, which are directly concerned with the production and consumption of nuclear fuel (separation plants and reactors) we have still to distinguish between activities which are "very dangerous" with respect to the possible diversion of material, and activities which are dangerous to a smaller degree. He asks if this circumstance does not make possible a system of control by which the very dangerous activities should take place "under international organization and in territory subject to international jurisdiction rather than in national territory."

This question has clearly political implications and implications of this kind have always been outside the scope of the discussions in our Subcommittee. Still we may perhaps be able to contribute to the answer of Dr. Nervo's question on the basis of the statement contained in our report.

Separation plants producing highly concentrated U-235 are certainly very dangerous, but in our opinion primary reactors or secondary reactors designed so as to produce significant amounts of nuclear fuel, together with the associated purification plants, are not less so. Less dangerous should be the hypothetical reactors for power production mentioned in our report, which only consume and do not

* This report was reprinted in full in the BULLETIN Vol. 2 Nos. 7 and 8.

regenerate nuclear fuel, including those which may possibly use "denatured" fuel. It is possible that reactors of the latter type may be built and operated some time, but however promising the idea of such reactors might be from the point of view of controls, we must, in the light of our present knowledge, just regard them as conjectural possiblities for the future. It is therefore difficult for us to discuss the precise danger which these reactors imply and the precise degree of control which they would require.

One thing can always be safely stated: reactors, of whatever type, will imply little danger if they are sufficiently small; such small reactors will be of importance for various kinds of research, for the manufacture of isotopes and radioactive material as neutron generators, and so on. As soon however as we consider reactors designed so as to develop significant amounts of energy, say at a rate corresponding to 1,000,000 kw, they will always involve considerable danger. One of the reasons for this danger and perhaps the main one, is that the amount of nuclear fuel necessary for the running of such reactors will be so big (say of the order of 1 kg U-235 per day) that diversion of material on a scale sufficient for the production of atomic weapons is possible.

Dr. Nervo said that he or any other member of the committee would possibly refer to this question again at a later stage.

Professor Kramers said that the scientific and technical committee had not been very happy to find that so little could be said on this matter now. Scientific collaboration of nations would probably find an answer to this question and to other important problems.

Gen. McNaughton (Canada) introduced a resolution:

"That Committee No. 2 proceed to examine and report on the safeguards required at each stage in the production and use of atomic energy for peaceful purposes to prevent the possibilities of misuse indicated in the report of the Scientific and Technical Committee.

"That for this purpose, Committee No. 2 establish an **informal working group,** composed of two members of each delegation, one of whom shall be a Scientific or Technical Representative, and with authority to consult other experts in any field related to atomic energy.

"That this informal working group report its conclusions to Committee No. 2."

He said:

"The work might conveniently be divided into certain distinct phases. The Scientific Report has indicated three distinct kinds of possible misuse, namely, diversion of materials, clandestine operations, and seizures of material or facilities.

"I would suggest that measures to prevent these possibilities of misuse be considered separately in relation to each stage in the production and use of atomic energy for peaceful purposes, beginning with the mines.

"Thus, in the first phase the discussion might lead to a report on various possible measures to prevent the diversion of materials from each activity in atomic energy for peaceful purposes considered in turn.

"Proceeding to the second phase, the Committee might discuss possible safeguards to prevent the clandestine operation of mines and other activities leading to the manufacture of atomic weapons. In dealing with this problem it would, of course, need to take into account the extent to which safeguards to prevent diversion of material would in themselves be effective in preventing clandestine operations.

"As a third phase the committee might discuss the problem of seizure and report on the possible measures of safeguard.

Mr. Hancock (U.S.) supported the Canadian resolution. He announced that the United States delegation would submit to Committee 2 for study a 50-page report which would deal with problems of control and which, he hoped, would clarify many problems before the committee.

Mr. Gromyko (USSR) objected against the provision in the Canadian resolution that one representative from each nation in the informal meetings should necessarily be a scientist. Resolution was accordingly amended and passed unanimously.

The available reports on the informal sessions of Committee 2, which began on October 14, are fragmentary.

On October 14, **Mohamed Bey Khalifa** (Egypt) took over the chair.

The Secretariat submitted a working paper that quoted General McNaughton's statement that the report of the Scientific and Technical Committee had indicated three kinds of misuse of atomic energy, namely, diversion of materials, clandestine operations and seizures of material or facilities. The Secretariat suggested the following outline of working program for Committee 2 within phase 1, following the sequence of activities in the flow charts appended to the report of the Scientific and Technical Committee:

(1) Uranium and thorium mines
(2) Concentration plants
(3) Refineries
(4) Chemical and metallurgical plants
(5) Primary reactors and associated chemical separation plants
(6) Isotope separation plants
(7) Secondary reactors.

The Secretariat paper stated that if this outline were followed Committee 2 would first turn its attention to the consideration of safeguards to prevent diversion of raw material in the mining and milling of uranium and thorium ores.

Sir George Thomson (United Kingdom) suggested that Committee 2 establish three panels to accelerate its work. These panels should deal with the topics listed by the Secretariat grouping them into three main categories: 1. Production of raw materials, extraction and refinement; 2. Separation; 3. Use of the material.

General McNaughton (Canada) in supporting this suggestion said that Canada was prepared to help in any way to give a picture of uranium mining in Canada.

The Committee unanimously agreed that informal conversations be held on the subject of raw materials.

This meeting was the first in which political delegates and technical advisers participated together.

* * *

On October 15, a second informal session was held. **Prof. Alexandrov** (USSR) made the proposal that a world-wide inventory of deposits of radioactive minerals be undertaken. He suggested that each nation submit full information on its resources of uranium and thorium, and pointed out that USSR can make this particularly easily because all its mines are state-owned.

Professor Alexandrov said losses incurred in the mining and milling of uranium ore were an important factor in production. He suggested that the report contain "an index of efficiency" on the loss factor.

Differences in the production of usable uranium depend largely on the techniques in different countries, he declared.

* * *

On October 17, a third informal meeting was held in which **C. S. Parsons** of the Canadian Bureau of Mines described the mining or milling of uranium at the Great Bear Lake works, and **Major O. Rangel** of Brazil spoke on the mining of monazite sands in that country.

* * *

On October 22, in a regular meeting of Committee 2, **Prof. Alexandrov** amplified his suggestions concerning the world review of raw materials.

The other delegations were mainly in-

terested to know whether the world inventory of uranium and thorium in the field proposed by Alexandrov is to be made under international auspicies or will be merely a review of data submitted by individual countries. If a geological survey of the world by international geological and mining expert teams is meant, this could be a decisive step towards effective international control; if only a collection of national data is intended, without provision for checking the correctness of these data by international inspection, the proposal cannot be taken as a serious contribution towards the control problem. A statement to the press by an attache of Mr. Gromyko, issued October 25, gave the following interpretation of Alexandrov's plan:

"The Soviet delegation considers the national control to be sufficient and, therefore, it might be possible to extend discussions on safeguards in the line of national controls."

* * *

On October 24, a fourth informal meeting was held, in which **Mr. Charles S. Parsons**, Canadian Bureau of Mines, gave an outline of the safeguards at uranium refineries in Canada.

In the discussion is was unanimously agreed that in uranium refining control was not only possible but could also be effected without an unduly cumbersome organization and without undue interference with the production process.

The discussion then turned to the question of safeguards in mines where uranium is a by-product.

Mr. Fred Searles, Jr., the mining expert of the United States Delegation, made a statement on the controls and safeguards in use in by-product mines in the United States. He divided these controls and safeguards into two stages: 1. Control of the mine itself; 2. Control of the mills and concentrators where the ores are processed. Mr. Searles pointed out that the question of control of these mines was more difficult and intricate than the one of control of uranium mines proper. Diversion of uranium was on one hand more difficult in by-product mines due to the low grade nature of the ore, on the other hand diversion was made easier by the fact that by-product mines were very often exploited as open cuts. Control measures, however, were perfectly feasible without interference with the normal operation of the mine, provided there was no collusion between the inspectors and the operators.

* * *

In the fifth informal meeting, held on October 28, the United States defined the following five types of safeguards for the effective control of atomic energy to implement the resolution adopted on October 18:

1. **Accounting** for materials includes such matters as (A) materials entering and leaving a plant and materials in process and in storage; (B) auditing the accounts, and (C) validating the accuracy of the data by quantitative measurements at appropriate points in the process.
2. **Inspection** consists of adequate observation of activities wherever diversions might occur or clandestine operations might be conducted.
3. **Licensing** constitutes permission to conduct certain activities under specified conditions such as plant design, approved processes, etc. It usually implies a degree of supervision by the licensor.
4. **Supervision** involves continuous association and co-operation in day-to-day operations with those responsible for management. It implies, also, authority to insist that management comply with certain established conditions.
5. **Management** (with or without ownership) involves direct responsibility for day-by-day decisions governing the operations.

* * *

The Discussion in The UN Assembly

The UN Assembly opened on October 23 in New York. Important references to atomic energy control were contained in the speeches of President Truman (US), Mr. Noel-Baker (Great Britain) and Mr. Molotov (USSR).

President Truman said:

"Two of the greatest obligations undertaken by the United States toward the removal of the fear of war remain to be fulfilled.

"First, we must reach an agreement establishing international controls of atomic energy that will ensure its use for peaceful purposes only, in accordance with the Assembly's unanimous resolution of last winter.

"Second, we must reach agreements that will remove the deadly fear of other weapons of mass destruction, in accordance with that same resolution.

"Each of these obligations is going to be difficult to fulfill. Their fulfillment will require the utmost of perseverance and good faith, and we cannot succeed without setting fundamental precedents in the law of nations. Each will be worth everything to perseverance and good faith that we can give to it. The future safety of the United Nations and of every member nation, depends upon the outcome.

"On behalf of the United States I can say that we are not discouraged. We shall continue to seek agreement by every possible means."

P. Noel-Baker (Great Britain), asserted that in the view of the British Government atomic energy was the most important question that would come before the Assembly at its present session.

He solemnly pleaded with the fifty other member nations to "open their frontiers and grant freedom of access to whatever extent might be required for international inspection."

Mr. V. M. Molotov's speech on October 29 was in large part devoted to a denunciation of the American and praise of the Soviet atomic energy plan. However, this polemic served as an introduction to a proposal for general disarmament which went far beyond the problem of atomic armaments. We print here the section of Molotov's speech dealing directly with the atomic bomb, but postpone a report on the general disarmament debate initiated by Molotov, and continued by the American representative, W. R. Austin, on October 30, to the next issue.

Molotov said:

"It is necessary to dwell on the question of the atomic bomb which now plays such an important part in political calculations of certain circles.

"Only recently J. V. Stalin, the head of the Soviet government, explained in a convincing manner the views of the Soviet Union on this subject. He especially emphasized that the atomic bomb 'cannot decide the outcome of war since atomic bombs are by no means sufficient for this purpose' and said also that 'if one is to speak of a threat to peace, certainly monopolistic possession of the secret of the atomic bomb does create a threat' against which there exist 'at least two remedies: (a) monopolistic possession of the atomic bomb cannot last long; (b) use of the atomic bomb will be prohibited.' These authoritative statements which resounded throughout the whole world and met with sympathetic response in the hearts of many millions of people ought to be duly appreciated.

"As we know there are two different plans regarding the use of atomic energy. I have in mind the plan of the United States of America on the one hand and the plan of the Soviet Union on the other.

"The American plan, the so-called 'Baruch plan', unfortunately is characterized by a certain degree of selfishness. It is based on the desire to secure for the United States the monopolistic possession of the atomic bomb. At the same time it calls for the earliest possible establishment of control over the production of atomic energy in all countries, giving to this control an appearance of international character, but in fact attempting to protect in a veiled form the monopolistic

position of the United States in this field. It is obvious that projects of this kind are unacceptable for they are based on a narrow conception of the interests of one country and on the inadmissible denial of the equality of states and their legitimate interests.

"This plan, moreover, is afflicted by certain illusions.

"Even in the field of atomic energy one cannot possibly count on the monopolistic position of any single country. Science and scientists cannot be put in a box and kept under lock and key. It is high time that illusions on this score were discarded. Illusionary are also the hopes for a decisive effect of the atomic bomb in time of war. It is common knowledge that the atomic bomb was used against such cities as Nagasaki and Hiroshima. The population of these Japanese cities experienced the cruel effect of the atomic bomb. The atomic bomb was nowhere used to deal with troops. And this is not an accident. If there are, however, plans to use atomic bombs against the civilian population of cities and to use them on a large scale at that, as certain of the newspapers babble, one should not give oneself up to any illusions with regard to the international effect which will be produced by the realization of atrocious plans of this kind. Justified resentment may gain possession of honest people in all countries and the enthusiasm about the decisive effect of the atomic bomb in a future war may entail political consequences which will mean the greatest disillusionment above all to the authors of those plans. Lastly it should not be forgotten that atomic bombs used by one side may be opposed by atomic bombs and something else from the other side and then the obvious collapse of all present day calculations of certain conceited but shortwitted people will become all too apparent. Illusions in serious matters are always dangerous which fact will probably be recognized both by Baruch himself and by his partners.

"All this goes to show that the truth is not on the side of the American plan not to mention the fact that the carrying out of this plan is in contradiction with the unanimously adopted decisions of the United Nations. It is sufficient to say that to carry out this plan it will be necessary to upset the United Nations Charter, to abandon the principle of unanimity of the great powers in the Security Council which is to decide the question of the atomic bomb. Is it not because there is a desire to give a free hand to the worshippers of the atomic bomb that someone is raising such a hubbub around the veto?

"All this goes to show that the Baruch plan does not meet the interests of the United Nations both as far as its substance and form are concerned.

"There is a different plan for the atomic bomb, the plan suggested by the Soviet Union. This plan is based on entirely different lines.

"We, the Soviet people, do not tie up our calculations for the future with the use of the atomic bomb. I would recall that the General Assembly has already declared for the exclusion of atomic weapons from national armaments. Therefore there is no reason to postpone the adoption of an international convention proposed by the Soviet Union regarding the banning of the manufacture and use of atomic weapons. Only by adopting such a decision will we create conditions favorable to a free and fruitful examination of the questions relating to the establishment of control over atomic energy in all countries.

"It was after the first World War that the nations reached an agreement to prohibit the use for military purposes of poisonous gases, bacteriological means of warfare and other inhuman implements of war. It is all the more necessary to prohibit the use for military purposes of atomic bombs as well as any other means of mass annihilation of people which in this particular case means the wholesale destruction of the inhabitants of cities and civilians in general when a merciless blow will mainly fall on children, women, sick and old men. Those who yesterday fought against aggressors and who are the true opponents of new aggression should consider it their sacred duty to outlaw the use of atomic bombs and to arrange for the use of the discovered atomic energy exclusively for peaceful purposes. Only such use of atomic energy will receive gratitude from mankind as a just solution. The honor and conscience of freedom-loving people demand that the atomic bomb be outlawed, for the United Nations will never assume the responsibility for any plans to use atomic energy for the purpose of wholesale destruction of people and in general to use it to the detriment of mankind.

"Our disputes in this case were probably inevitable owing to the novelty of the question, but in this case, too, we must avoid the division into two camps; into that of militant atomists on the one hand and that of the advocates of the use of atomic energy exclusively for peaceful purposes on the other. We should therefore believe that the exchange of views on this subject which has been started will in the long run result in a unanimous opinion among the United Nations including the United States.

"Otherwise what would people think and what would we reply to their perplexed questions?

"The other day you may have read in the New York papers the speech made by Mr. Baruch who was fairly outspoken as regards his views on war and peace. On October 12th at the College of the City of New York he stated: 'Peace seems beautiful during the savagery of war but it becomes almost hateful when war is over.' Further in the speech Baruch was not sparing of words in expressing his love for 'freedom.' But it is easy to guess that his conception of freedom is far removed from the real aspirations of common people for freedom, well being and lasting peace. He would like to see all people satisfied with the freedom under which only the lucky ones can enjoy the benefits of life not only in time of prosperity and peace but amid the conflagration of war. His sentiments are alien to the people who sweat in heavy daily toils or who with their own hands and at the cost of their life defend the freedom and future of their native country. Otherwise public men belonging to his class too would have to agree that in our time the so-called 'common people' are mostly concerned that their governments and their statesmen should see their main task in the defense of peace and security of nations because after all the trials of the Second World War the striving for security and lasting peace is the innermost sentiment of common men and women throughout the world.

"Far reaching plans connected with the atomic bomb are perhaps dictated by the very same philosophy which finds its expression in the words: 'Peace becomes almost hateful when war is over.' "

* * *

The four proposals with which Molotov ended, included, under Nos. 2 and 3:

"2. The implementation of the decision on the reduction of armaments should include as a primary objective the banning of the manufacture and use of atomic energy for military purposes.

"3. The General Assembly recommends to the Security Council to provide for the practical achievement of the objectives set forth in the above mentioned paragraphs . . ."

The passage from the speech of Mr. Baruch which Mr. Molotov used to attack him as a warmonger, ran as follows:

"Peace seems beautiful during the savagery of war, but it becomes almost hateful when war is over. Each disputant then demands a peace made in his own image instead of a peace acceptable to all. But there are some things more precious even than peace, and the greatest of these is Freedom."

Baruch and Hancock Defend the American Plan

The "Baruch plan" has been under attack from two sides. The Soviet criticism has just culminated in the vicious attack on Mr. Baruch by Foreign Minister Molotov (in the speech reprinted elsewhere in this issue). This attack is directed against the very principle of an International Atomic Development Authority, and also, although less consistently, against international inspection. The domestic criticism, voiced most forcefully in Mr. Wallace's letter (reprinted in the last issue of the Bulletin) accepts fully the fundamentals of the American plan, but suggests abandonment of the request for the abolition of veto power in cases of violation of the atomic energy convention, and generally advocates a less rigid attitude on the side of the American delegation.

During October, Mr. Baruch and his colleagues have, on several occasions, vigorously defended the American plan, refusing concessions to either foreign or domestic critics. They also rejected Mr. Wallace's suggestion of a voluntary interruption of American bomb production as a gesture of good will. In this, they used a somewhat contradictory argument, asserting that, in the first place, no country can be asked to renounce unilaterally its most decisive weapon, and in the second place, cessation of bomb production will be an empty gesture unless the production of fissionable materials is stopped, too. The latter is a request which nobody has made and which the Soviet delegates in particular, cannot make as long as they refuse to discuss the control of atomic energy, and insist on dealing only with the outlawing of bombs.

Because of lack of space, we can reprint here only the most important passages from the authoritative pronouncements of Mr. Baruch and his colleagues.

In receiving the Freedom House plaque from the hands of Mrs. Roosevelt on October 8, **Mr. Baruch** said:

"The plaque reads: There must be no veto for those who violate their solemn agreements."

" . . . I am happy that Freedom House chose this text, for it exemplifies one of the weightiest points in the American attitude—the non-application of the Great Powers' veto to protect offenders, once a treaty of prevention and punishment dealing with atomic energy has been agreed upon. Our proposal is concerned with the veto power only as it affects this particular problem, and not with the general veto written into the structure of the United Nations.

"America asks nothing she is not willing to give. All of us must make contributions.

"But I would be recreant to my trust if I dared to recommend the immediate abandonment of a major weapon in our arsenal—the bomb. How can any one ask destruction of existing bombs unless their further manufacture is effectively prohibited? Why should America alone be asked to make sacrifices by way of unilateral disarmament in the cause of international good will?

"I now say that America stands ready to proscribe and destroy the atom bomb, if the world will join in a pact to ensure the world's security from atomic warfare. But it must be a realistic working pact—not merely a pious expression of intent, wholly lacking in methods of enforcement.

"The Soviets protest that inspection violates national sovereignty. Better that—than international disaster. America is willing to accept inspection as a control measure and for some time America would be the most inspected.

"I am at a loss to understand why national sovereignty should be made such a fetish. Other international processes require the presence of officials of one nation within the territory of another; they include customs, mails, treatment of war prisoners, and so forth. Every treaty involves some diminution of absolute national sovereignty, but nations enter into such treaties of their own free will and to their common advantage. Indeed, freedom to enter into such voluntary international arrangements is inherent in the very concept of national sovereignty.

"Here are the irreducible minima essential to the effective control of atomic energy:

1. Control through an international agency of the production and use of uranium and thorium, of fissionable materials, and of their products to the extent necessary to ensure their use for peace and prevent their diversion to war. The control must include:
   a. Free access for international inspection sufficient to prevent unauthorized activities in atomic energy or to detect them soon enough to protect complying states against the hazards of violations and evasions.
   b. Sufficient control of each step in atomic energy production to prevent diversion for illegal purposes.
   c. An international agency with resources and authority adequate to carry out its day-to-day responsibilities.
   d. Provision for the international agency to lead in atomic energy research so as to make it an aid to social purposes and carry out effectively its preventive operations.
2. Prohibition, including provision for swift and certain punishment, of the following activities:
   a. Illegal possession or use of an atomic bomb.
   b. Illegal possession, or separation of, atomic material suitable for use in an atomic bomb.
   c. Seizure of any plant or other property belonging to or licensed by the international control authority.
   d. Willful interference with the activities of the international control authority.
   e. Creation or operation of dangerous projects in a manner contrary to, or in the absence of, a license granted by the international control body.
3. Transition to full international control by successive stages to be specifically set forth in the treaty and agreed to by all. The stages must be so designed as to be fair and equitable to all nations; they must bring the system of safeguards fully into being as rapidly as possible; and they must not endanger any nation's security in the event of a breakdown during the process of transition under the treaty.
4. Provision that no nation which has accepted the international control treaty can be protected from punishment for violation of its terms through use of a veto whether cast by the violating state or by any other nation.

"In the elimination of war lies our final solution, for only then will nations cease to compete with one another in the production and use of dread 'secret' weapons (atomic, biological, bacteriological, gas and others), which are evaluated solely by their capacity to kill. That devilish program takes us back not merely to the Dark Ages but from cosmos to chaos. If we succeed in finding a suitable way to control atomic weapons, it is reasonable to hope that we may also preclude the use of other weapons adaptable to mass destruction. When a man learns to say 'A', he can, if he chooses, learn the rest of the alphabet."

In addressing the convention of the American Life Insurance Co. in Chicago on October 11, **Mr. Hancock** said:

"The January 24, 1946 resolution of the General Assembly of the United Nations directed the Commission to make specific proposals 'for **control of** atomic energy **to the extent necessary to ensure its use only for peaceful** purposes and for **effective**

safeguards by way of inspection and other means to protect complying states against the hazards of violations and evasions.'

"It would have been so easy for the Assembly to follow the old practice for handling such problems. It would have been easy to require the Commission to draft a resolution simply outlawing atomic bombs. Apparently the Assembly had in mind all of the efforts over the years to outlaw various implements of war, all of which had proven their dismal ineffectiveness. It has been clear from the start that the least that can be sought is an adequate warning to the world of any planned evasion of an atomic energy treaty, and that this warning should be timely enough to protect the world against a surprise attack.

"This treaty is to follow a new pattern, something never attempted in the world before. This is to be a treaty which the world will know is being kept, or which the world will know is not being kept, thus enabling the punishment of the violators at an early date.

"The United States plan—while it may startle those who seek the easy, the conventional solution—is surely a realistic approach to the hard facts of the problem. It conforms not only to the facts and the needs of the situation but also to the mandate of the General Assembly which specifies a solution based on proposals for controls and effective safeguards.

"In brief, the United States has proposed an international authority with unequivocal power to exercise full and effective control over atomic energy from birth to death and a system of swift and certain punishment for violations which shall be stigmatized as international crimes.

"It believes that a willingness of nations to submit to inspection by an international body is the best evidence of honorable intentions not to use the bomb and also to make only the proper peacetime uses of atomic energy. It also believes that unless the Authority has power to report infractions and to initiate punishments, the whole international control plan will be mere words, and become a fraud upon the people of the world.

"If the nations of the world should decide upon an international authority with full responsibility to prevent the making of a bomb, while at the same time giving full impetus to the peaceful uses of atomic energy; if they will give an international organization the requisite powers to discharge this responsibility, with the right to know what is going on in the atomic energy field anywhere in the world, with power to enforce its everyday operating decisions, with power to bring offenders before a bar of international justice, and with the creation somewhere in the United Nations organization of adequate power to punish; if these decisions can be made —then it should not be too difficult to state when or under what conditions the United States will cease making bombs, and ultimately when and under what conditions it will dispose of its existing stock of bombs and bomb materials.

"However, it seems futile even to discuss the conditions under which these two events would take place unless a decision has been arrived at to create an effective plan of controlling atomic energy, the minimum essentials of which in the United States proposals include:

1) An international control body with adequate powers;
2) A system of inspection based on free access; and
3) Appropriate provisions for preventions and punishment, without recourse to the veto.

"It has been argued that it would be a great gesture of good will on the part of the United States, which would further the negotiations toward the control of atomic energy, if the United States were to agree to stop making bombs at this date and were to announce this decision. In my opinion, that is a very superficial view of the problem. The suggestion essentially is for unilateral disarmament so far as this nation is concerned. No other nation has as yet offered even a minimum of disarmament, let alone the elimination from its arsenal of any comparably powerful weapon. However, let us suppose, for the sake of argument, that this country were to announce that bomb manufacture had ceased. This would lead to demands as to how many bombs we have stockpiled and probably also to demands for the right to inspect our manufacturing plants to ensure the world that we had in fact stopped. In the present state of mind of the World, it wouldn't be too fanciful to assume that we had already accumulated such a stockpile of bombs that we already had enough for any contingency. Certainly this charge would be made and with some plausibility by those who were not convinced of our good faith.

"The suggestion of merely stopping the manufacture of bombs is a thoroughly impractical one unless it were accompanied by the stopping of the manufacturing of the fissionable materials themselves. If this were stopped, the result would affect adversely the development of atomic energy for peaceful purposes.

"Furthermore, it must not be forgotten that many nations would lose the sense of security they now enjoy because of the U. S. possession of the bomb. I assure you, gentlemen, in all sincerity that we have been deeply moved by the expression on the part of many nations of the faith and sense of security they feel in our possession of the bomb.

"Finally, if the United States, by itself, were to agree now never to use the bomb under any possible condition—and nothing less than that would apparently suit the proponents of the idea—it seems entirely clear that we would never be able to secure an effective plan for controlling atomic energy.

"There has been a great deal of discussion about our idea concerning the veto. There seems to have been an entirely unwarranted assumption that we were making a general attack upon the veto, now in the power of the Big Five members of the Security Council. Nothing could be further from the fact. From the start, we have insisted on only two points which would come into being after the treaty has become effective:

"First: That the veto power now in the Security Council must be used to protect violators of the crimes which we describe in general terms as the "production or use of an atomic bomb," and which would include such preparatory steps as unwarranted possession of atomic material suitable for use in a bomb; seizure of any plant belonging to the Authority; or any wilful interference with the Authority's operation. These crimes are not such as would certainly lead to war in all cases. There seems nothing controversial about setting up these acts as crimes and providing a certainty of punishment for them, particularly since the treaty involving atomic energy will be submitted to the nations of the world who will have their chance to refuse the treaty in its entirety, including the provision eliminating the veto. In this field of crime, all we ask is that no nation be free to protect a violator from the penalties established for his crimes.

"Second: One other field of operation likewise should not require unanimous consent: The day-to-day operations of the international authority should not require unanimous approval and should not be thwarted by the desire or determination of any one nation.

"In all my search to get at the root of the questions about the veto, I have not found a satisfactory ground for objection to the United States plan. I know the claim is made that the veto issue is not relevant and also the claim is made that it was bad timing to raise this question so early in discussion. We knew perfectly well that the suggestion would not be welcomed by all the world, but realizing the necessity for it and seeing no valid objection to it, we proposed it frankly at the first session of the United Nations Atomic Energy Commission.

"It is obvious that many nations having deposits of uranium and thorium would never consent to turning these materials over to nations for peaceful use or war use, if the nations receiving the materials were left free to decide which use they

were going to put the material to and, particularly, if the nation receiving the material were to be free from punishment at the whim of any one of the Big Five. Perhaps the confusion comes from a failure to understand that this treaty governing atomic energy is to be a treaty of a different nature than any treaty, which will not depend on the conscience of any nation for its observance. The world will know whether the treaty is being observed and in the event of failure will be able to take appropriate action. In every treaty so far proposed in history, there has been no provision for the world to know that a nation intends to violate its solemn covenants, and there has been no plan of punishment short of war itself. This treaty governing atomic energy must be such that no nation may undertake a misuse without, at the same time, the world becoming aware of its attempt, and without subjecting itself to appropriate and prompt and certain punishment. Under the old pattern of treaties, it would be perfectly right to say that the veto was not relevant to the present discussions. But this is not to be that kind of a treaty.

"That's our whole position on the veto.

"All of the documents comprising the United States plan are available as a matter of public record. However, let me tackle a few public misconceptions:

"We are not trying to tear down the United Nations structure, but are determined to strengthen it.

"We have no alternate plan to recommend in the event we fail.

"We have not considered any other plan because we were told by the Assembly of the United Nations to do this one job.

"We have not asked other nations to disclose during the negotiations their uranium and thorium resources. We have not proposed that other nations refrain from research on the atomic bomb during the time we are to be free to carry on such research.

"We have at no time proposed that we turn over our knowledge of atomic energy only when the international control and inspection system is working 'to our satisfaction,' nor have we proposed to dispose of our bombs only 'at our unfettered discretion.' We have proposed, specifically, that when an adequate system for control of atomic energy, including the renunciation of the bomb as a weapon, has been agreed upon (by all) and put into effective operation and condign punishments set up for violations of the rules of control which are to be stigmatized as international crimes we propose that:

1. Manufacture of atomic bombs shall stop;
2. Existing bombs shall be disposed of pursuant to the terms of the treaty; and
3. The Authority shall be in possession of full information as to the know-how for the production of atomic energy.

"We have not opposed national legislation which would make individuals liable to punishment for any of the crimes which we have enumerated. We have said that national legislation alone is not sufficient because such legislation does not make nations responsible or subject to penalty."

* * *

The following statements were made at the Herald-Tribune Forum on October 29:

Mr. Baruch: Frequently the American delegation has been asked why we're not ready to accept the Russians' convention or treaty to outlaw the bomb and destroy our present stock. The answer is simple: We are ready to accept it. In fact, we originally proposed a similar plan, but only as a part of the whole. The treaty that will save the world must be realistic in its workability and effectiveness, instead of merely an expression of pious intent.

Let this always be in your minds:

Production of atomic energy for peace or war is the same up to a certain point. Produced for peaceful purposes, it is 75 per cent on its way toward the atomic bomb and destruction. So that it shall not be diverted to war, it is necessary, through an international atomic agency, to begin at the raw materials and to use every device of control, including licensing, inspection, accounting, operation and management as protective measures.

When all this is agred upon by a treaty in final form, all our know-how, stock of bombs and raw materials will be turned over or disposed of in accordance with the treaty, which, of course, must be ratified under the constitutional processes of each nation.

I wish it were in my power to make it crystal clear that the United States has no ulterior motive—that it desires to serve the world and, in so doing, serve itself. We are, as we have been, ready to give thought to any suggestions that seek this goal. But there will be no surrender of the bomb unless and until we know that all other countries are prevented from doing the very thing we would be giving up—bomb making. Are we to be the only ones to disarm? That way is suicide.

Mr. Hancock: The Authority must have power of inspection, first, in order to make certain that all activities under its control are being carried out properly, and second—and more important—in order that any attempted illegal action by a nation or individual can be detected promptly and appropriate corrective measures taken.

The power of inspection must include the right of free access anywhere in the world. Without free access inspection would be meaningless.

It is difficult to see how any nation which sincerely desires an effective control of atomic energy can object to inspection, for not only is inspection indispensable to such a system but it is also a means whereby nations may prove their sincerity.

Mr. Eberstadt: I would like to emphasize two points:

In the first place, it is not safe to embark upon this enterprise until the entire project has been carefully programmed and wrapped up into a "single package" in a treaty freely agreed to and accepted by all participating nations. We cannot get part way through the process only to find that we have taken some action which will be used to the detriment of this and other peace-loving nations.

The second point is that, once we have agreed to the terms of the treaty, we need not—indeed we cannot in equity—retain in our hands sole determination of when each stage has been completed and the next is to begin. This determination can be left to an international body, preferably the United Nations, where other nations as well as ourselves will pass fair judgment on the questions involved.

Gen. Farrell: We are prepared to disclose full information on atomic energy once a truly effective international system of control has been established. Common sense demands that this be done, however, only when we—and by we I mean the world—can be sure that no nation can use this knowledge to produce atomic bombs. This is the real security we seek, not for ourselves alone but for the world.

Here are some answers given by Mr. Baruch and his colleagues to questions from the members of the Forum:

Q—Why doesn't the United States immediately announce cessation of the manufacture and stockpiling of atomic bombs? Wouldn't this action on our part be of tremendous help to the negotiations? A—(by Mr. Hancock) I think the suggestion overlooks every demonstration already given of the sincere desire of this country to outlaw the use of the weapon. Our only condition is that if we were to outlaw its use, it must not be possible for any other nation to produce an atomic weapon for use on this or any other nation.

The suggestion is a thoroughly meaningless one, unless it were accompanied by the stopping of the manufacture of fissionable materials themselves and the dismantling of our installations and facilities. To do these things would adversely affect the development of atomic energy for peaceful purposes which we and the world are anxious to foster.

Q—The Atomic Development Authority idea is a step toward world government.

How can this kind of solution be effective unless we go the whole way? A—(by Mr. Eberstadt) It may very well be that a world government may be the only final solution to the problems of international relations. Under a world government it may be possible to abolish war itself. Even the most ardent supporters of world government, however, will recognize that the goal is a long way off. As Mr. Baruch has stated, "If one learns to say 'A' he can learn the rest of the alphabet." To put it another way, however, the letter "A" comes before the rest of the alphabet.

We feel that the successful establishment of a truly effective Atomic Development Authority will serve as a pilot plant to broader and more inclusive international agreements. If a fully effective A. D. A. can be brought into being and if nations of the world can come to co-operate willingly and constructively in this one enterprise, then we will have learned "A" and can proceed to learn the rest of the alphabet.

Q—*Has there been any change in the United States policy as laid down by Mr. Baruch on June 14? Is any major modification of this plan possible?* A—(addressed to Mr. Hancock, but Mr. Baruch volunteered the answer.) Of course modifications are possible. Our proposals are neither stubborn nor inflexible except insofar as the facts of these problems themselves are stubborn and inflexible. We do not wish to dictate to any one; however, the facts dictate to us all. We stand ready, as I said on June 14, to accept any changes that are helpful to our general purpose, but that purpose must be a true solution to the problem imposed upon us, not merely the alleviation thereof. When I say that we cannot accept a mere convention, I say so because a convention is no solution to our problem. When I say we cannot accept a convention, I feel that I speak not only for the American people but for all peoples of the world who want and who demand an effective control of atomic energy.

Q—*What has been accomplished in the course of the negotiations to date? Is there any reason to hope that a satisfactory agreement can be arrived at soon?* A—(by Mr. Eberstadt) Since the beginning of the negotiations on June 14, a number of things have been accomplished. (1) The United States proposals have been presented and elaborated in some detail. (2) The Soviet proposals have been made and elaborated in some detail. (3) All delegates have had full opportunity to express their views. (4) Turning to the basic facts of the problem, the Scientific and Technical Committee was able to report unanimously the conclusion that there was no reason to believe from a scientific point of view that control was not technologically feasible. (5)The Commission's Committee on Controls has undertaken a discussion based on the facts agreed to in the report of the Scientific and Technical Committee. When one considers the tremendous complexity of the problem, I submit that real progress has been made. If discussions are continued on the basis of agreed facts, there is hope that the negotiations may be successful. When an agreement may be reached is another question. No one is in a position to say. We must all have patience.

Q—*If any great nation is adamant in its opposition to an A. D. A. would a treaty to which a large majority of the other nations subscribed be desirable?* A—(by Mr. Hancock) Our job is to secure a treaty establishing an international control agency to which all nations can subscribe. If some nation, or nations, should prove unwilling to enter into the sort of treaty we propose, then we shall have failed; and some other action by our government would be necessary. We are not in the business of thinking up alternatives. Some one else will have to do that, if and when the time comes. Any alternative which excluded any major power, or powers, would have to be quite a different one from the one we have proposed.

Stalin for International Control

Stalin, (in his answers to questions submitted by Hugh Baillie, of the United Press, on October 28) gave the following views on the atomic bomb:

Question: Has Russia yet developed its own atomic bomb or any similar weapon?
Stalin: No.

Question: What is your opinion of the atom bomb or a similar weapon as an instrument of warfare?
Stalin: I already gave my evaluation of the atom bomb in a well known answer to Mr. Werth.

The answer to which Stalin refers was given on September 24 and disparaged the atom bomb as "not as serious a power as certain political persons are want to think" and as a "means to frighten the weak-nerved, but unable to decide the fate of war."

Question: How in your opinion can atomic power best be controlled? Should the control be created on an international basis and to what extent should the powers sacrifice their sovereignty in the interest of making control effective?
Stalin: *A strong international control is needed.*

It will be noted that Stalin evades answering the second half of the question. If the answer means anything, it is a repudiation of the thesis of exclusively national control so stoutly defended by Gromyko in the UN Atomic Energy Commission.

International Research Laboratories Discussed by the Economic and Social Council

On October 3rd the proposal of the French Delegation that the Secretariat, in consultation with UNESCO should submit a report on the problem of establishing United Nations Research Laboratories was adopted by the Economic and Social Council.

Specific reference was made to the great advance achieved in the field of atomic research by international cooperation during the war.

Mr. Henri Laugier, Assistant Secretary-General for Social Affairs pointed out that the proposal did not call for the actual establishment of United Nations Research Laboratories, but merely urged that all possible information should be collected and that the possibility of establishing such laboratories should be examined.

A number of delegates spoke in favor of the proposal, stressing the fact that since all that was suggested was a survey and report, there could be no good reason for opposing it.

Mr. Nikolai Feonov (USSR) contended that the French proposal went further than merely asking for a survey.

He quoted Paragraph 1 of the Resolution which states:

> "1) That a certain number of research activities can only be conducted . . . on an international scale . . ."

Mr. Feonov said that he saw there a clearly defined idea that as a natural development of national research activity there would follow combined international organizations.

He maintained that if the United Nations set up such laboratories as those envisaged it would become an "enormous international business" because the idea would be carried over into other fields. This he said would result in its becoming so cumbersome, and involve it in such vast expenditure that the Secretariat would not be able to carry on its proper functions.

Later, in answer to Dr. Lev Medved (Ukraine) who added his weight to the Soviet argument, Mr. Parodi asked whether the Ukranian delegate would, or would not, like to see research similar to atomic research, conducted on an international level.

The remark was not taken up and Dr. Andrija Stampar, President, called for a vote.

The USSR and the Ukraine voted against the proposal, which was adopted by 14 votes to 2.

New Government Agencies . . .

Atomic Energy Commission Appointed

On October 28th, the President made the following announcement:

"I have today named David E. Lilienthal Chairman of the Atomic Energy Commission, and his associates on the commission, Robert F. Bacher, Sumner T. Pike, Lewis L. Strauss, and William W. Waymack.

"Together these men—each of whom has distinguished himself in his public and professional career—will bring to the work of the commission abilities and experience which will command the confidence of the country. We may be grateful that they have been willing to set aside all personal considerations, and to take, as members of the commission, responsibilities as great as any men have ever assumed in peace time.

"The commission will take over properties and an organization which in magnitude are comparable to the largest business enterprises of the country. There is no activity—government or business—upon which the security and the enrichment of our nation are more heavily dependent.

"During the war the Army was charged with responsibility for atomic energy, and under General Grove's guidance the Manhattan District carried the project forward with brilliant success. Now, in accordance with the Atomic Energy Act of 1946, the entire program is to be transferred to the new commission. It will continue to move forward with the complete cooperation of the military and civilian personnel of the Manhattan Engineer District and all its many contractors, and with the full support of the War and Navy Departments.

"The commission obviously must have a period of time in which to study the present program in detail, to analyze the broad scope of the problems facing it, and to lay plans for carrying out its very great responsibilities. The orderly transfer of functions and properties from the Manhattan District may well extend over a period of months.

"Discussion of the preliminary steps is already under way and the transfer will be accomplished as expeditiously as possible. During the period of transition, however, the commission has asked the War Department to continue to carry on functions and operate facilities of the Manhattan Project, so that there will be no interruptions in work while the actual transfers are being carried out. To this arrangement, which meets with my approval, the Secretary of War and General Groves have agreed.

"Under the broad charter and the general policies which the Congress has formulated in the Atomic Energy Act of 1946, we look to this commission to develop and carry on an ever-expanding program through which the benefits of atomic energy may be realized.

"We recognize that the full measure of these benefits cannot be achieved without the establishment of adequate international controls. We must therefore, always be mindful that the most important step in realizing the promise of atomic energy for ourselves and for the world is the successful conclusion of the negotiations which are now in progress in the Atomic Energy Commission of the United Nations. Chairman Lilienthal and his associates, through their effective administration of our atomic energy program, will be of material assistance in advancing us toward that goal."

* * *

According to the McMahon Bill, the commission is to nominate its General Manager, and the President is to appoint a 9-man General Advisory Committee—a body which, it is hoped, will include a number of scientists.

* * *

The following are short biographical data on the members of the commission:

David E. Lilienthal

Lilienthal is Chairman of the Tennessee Valley Authority, and was Chairman of the State Department Board of Consultants on Atomic Energy.

From 1931 to 1933 he served as a member of the Wisconsin Public Service Commission. In this position he first attracted attention by his insistence of lower utility rates and more widespread use of electric power.

He was appointed a Director of the newly-created TVA in 1933. As a Director of the TVA he was charged specifically with the development of its power program and much of the TVA success in broadening the use of electric power by consumers in the valley is credited to him.

William W. Waymack

Waymack, Editor of the Des Moines Register and Tribune since 1942, has been connected with that newspaper in various positions since 1914.

Newspaper work brought him the Pulitzer prize for distinguished editorial writing in 1937. Waymack has served in numerous government capacities. He is a Director of the Federal Reserve Bank, Chicago; served as special adviser of the State Department in 1942, and as an associate public member of the national War Labor Board in the same year. He also served as a consultant of the War Food Administration.

He is a Director of the Carnegie Endowment for International Peace, the American Association for United Nations, Freedom House, Inc., the Woodrow Wilson Foundation, and the National Conference of Christians and Jews. Recently he was a member of the Allied Commission to observe the Greek elections.

Sumner T. Pike

Pike served from 1940 to 1946 as a member of the Securities and Exchange Commission, and has held various other governmental assignments. He was adviser to the Secretary of Commerce in 1930-40 and a member of the Temporary National Committee in 1940-41.

From 1920-22 he was Vice-President of the Equipment Sales Co. of Dallas, Tex., and Kansas City, Mo.; was Secretary of the Continental Insurance Co. from 1923 to 1928, and Vice-President and Director of the Case, Pomeroy & Co., New York, from 1928 to 1939.

Robert F. Bacher

Bacher is the only atomic scientist and the youngest member of the newly-appointed commission.

At present Professor of Physics and Director of the Laboratory of Nuclear Studies at Cornell University, he was associated with Dr. Robert Oppenheimer at the Los Alamos laboratory in New Mexico, where the first atomic bomb was exploded.

He received a Bachelor of Science degree from the University of Michigan in 1926, and a doctorate in 1930. After advanced studies at the California Institute of Technology, the Massachusetts Institute of Technology and Michigan, he became an Instructor at Columbia in 1934.

In 1937 he went to Cornell where he was successively Assistant, Associate and Professor of Physics. He is the author of numerous scientific papers on atomic energy and related subjects.

Lewis L. Strauss

Strauss, like Lilienthal, brings to the commission a familiarity with the problems of atomic development and use.

As naval reservist called to active duty as Chief of Ordnance Inspection, a year before Pearl Harbor, he served as a Navy member of the Army-Navy munitions board and as a member of the Interdepartmental Committee on Atomic Energy.

Interested in the peacetime uses of atomic energy, he was active in isotope research before the war for use in cancer therapy. He is a director of the Institute for Advanced Study at Princeton and the Memorial Cancer Hospital of New York.

During World War I he served as Private Secretary to Herbert Hoover and with the U.S. Food Administration and American relief overseas.

National Commission of UNESCO Named

In accordance with the UNESCO charter which provides for the creation of National commissions to support the activities of the Council, a commission of 100 members is to be formed in America. Of these the names of 86 were announced on September 18 and 19 by the Assistant Secretary of State, W. Benton.

These members include:

10 **Federal Government Representatives,** among them: General Omar Bradley (Veterans Administration), Luther H. Evans (Librarian of Congress), John W. Studebaker (Commissioner, U. S. Office of Education), David E. Finley (Director, National Gallery of Art), Thomas Parran (Surgeon General), Alexander Wetmore (Smithsonian Institution).

13 **"Members at Large"**, (2 still to be appointed), among them: Chester Bowles, B. M. Cherrington (Social Science Foundation, University of Denver), A. H. Compton, Mrs. M. McAffee Horton (President, Wellesley College), A. MacLeish, Edward R. Morrow, Mrs. Anna Rosenberg, Beardsley Ruml, John Hay Whitney.

14 **Representatives of State and Local Governments,** (One still to be appointed), among them: R. A. Beale (Director, N. Y. Public Library), Milton Eisenhower, (President, Kansas State College), C. A. Dykstra (Provost, University of California), R. Gustavson (Chancellor, University of Nebraska), G. Stoddard (President, University of Illinois).

49 **Representatives of Organizations,** (11 still to be appointed). Only five among them can be classed as natural scientists: J. B. Conant (Chemist, representing American Association for the Advancement of Science), R. G. Harrison (Zoologist, representing National Academy of Sciences), and D. Bronk (Physiologist, representing National Research Council). The Commission has the right to invite ten additional organizations to send representatives, and this may perhaps enlarge the obviously totally inadequate representation of the natural sciences.

The following comment by W. J. Murphy is from an editorial in the "Chemical and Engineering News", organ of the American Chemical Society:

"A glance through the recently released list of ninety members of the National Commission on Educational, Scientific, and Cultural Organization discloses the rather discouraging fact that with a few notable exceptions natural scientists are conspicuous by their absence. Such slighting of the natural sciences, in this day and age, whether intentional or otherwise, is inexcusable. Among the truly great forces that prevail today, science is the one that has progressed farthest along the path of international cooperation and understanding. Natural scientists have been and still are, despite the temporary conditions forced upon them by World War II, the most internationally-minded group in the world today.

"We believe that the present paucity of natural scientists on the American UNESCO delegation will slow the work and retard the achievement of the worthy objectives of UNESCO.

"We are conscious of the possible existence of a feeling on the part of many non-scientists that natural scientists are now, in the atomic age, suffering from a superiority complex. We are not among those who believe that natural scientists have a perfect panacea for all the difficulties the world now finds itself in. We do believe that natural scientists working in unison with other groups can assist in promoting scientific, economic, political, and social cooperation. It is a strange paradox that we are largely ignored at a time in history when we have so much to offer."

President Establishes Scientific Research Board

A Presidential order, dated October 17, instructs the Director of War Mobilization and Reconversion (Mr. Steelman) to:

"Review the current and proposed scientific research and development activities conducted or financed by all departments and independent establishments of the Government to ascertain (1) the fields of such research and development and the objectives sought; (2) the type and numbers of personnel required for the execution of such programs; (3) the extent to and manner in which such research and development is conducted for the Federal Government by non-Federal profit and non-profit institutions; (4) the cost of such activities.

"Review from readily available sources (1) the nature and scope of non-Federal scientific research and development activities; (2) the type and numbers of personnel required for such activities; (3) the facilities for training new scientists; and (4) the amounts of money expended for such research and development.

"Advise with the Director of the Bureau of the Budget in respect to such aspects of the foregoing matters as have a bearing upon the **Federal Budget.**

"On the basis of these studies and such other information as the Director may deem appropriate, prepare and submit a report to the President setting forth (1) his findings with respect to the Federal research programs and his recommendations for providing coordination and improved efficiency therein; and (2) his findings with respect to non-Federal research and development activities and training facilities, a statement of the interrelationship of Federal and non-Federal research and development, and his recommendations for planning, administering, and staffing Federal research programs to insure that the scientific personnel, training, and research facilities of the Nation are used most effectively in the national interest.

"To assist the Director in the performance of his duties hereunder, there is established an interdepartmental board to be known as the **President's Scientific Research Board,** which shall consist of the Director as chairman, the Secretary of Agriculture, the Secretary of Commerce, the Secretary of the Interior, the Secretary of the Navy, the Secretary of War, the Federal Loan Administrator, the Federal Security Administrator, the Federal Works Administrator, the Director of the Office of Scientific Research and Development, the Chairman of the Federal Communications Commission, the Chairman of the Tennessee Valley Authority, and the Chairman of the National Advisory Committee for Aeronautics, each of whom may designate a full-time member of his staff as alternate to act in his stead. The Director may from time to time designate as members of the Board heads of other departments or independent establishments engaged in Federal research or development work. The function of the Board shall be to assist the Director in making the studies described in paragraph 1 and to advise and consult with him in the preparation of reports required by this order."

ARMY DIVISION OF RESEARCH AND DEVELOPMENT

Its Director, General Aurand, is responsible directly to the Chief of Staff and Secretary of War. C. H. Marvin, President of George Washington University, is Deputy Director. The Director is to be advised by a civilian advisory panel of 75 scientists. (See article by General Aurand in this issue.)

OFFICE OF NAVAL RESEARCH

This office, headed until November 1, by Admiral Bowen, and beginning November 1, by Commodore Paul F. Lee, has so far this year initiated 400 research projects, half of them by contracts with Universities and other independent research institutions.

Radiation Hazards and Radiation Sickness

. . . . . Dr. Hermann Lisco

I

Recent discussions concerning the "Atomic Age" have ranged from National and International Control of Atomic Energy to the benefits that may be derived in the future from the use of radioactive tracers in research in physics, chemistry, biology and medicine.

There is one aspect of Atomic Energy that to the knowledge of the writer has not been discussed with the frankness that it requires.

Radiation sickness in its various manifestations has been known almost as long as X-rays have been available for therapy. It has been a problem of considerable practical and theoretical importance to relatively few people. Roentgenologists who treat patients with X-rays and physicians who are concerned with the care of patients who have been treated in this way are acutely aware of this disease. Indeed, the frequent occurrence of this condition in the course of treatment with X-rays often imposes limitations on the extent of such treatment.

Radiation sickness might be a problem of very considerable importance in the future, for the lives of many people have already been and those of many more people will be affected in the future in one way or another by the industrial development of the fission process.

II

Radiation sickness might come about in a number of ways, but we shall consider only two:

A. Radiation sickness caused by external irradiation in atomic warfare or by accidents or negligence in atomic energy laboratories.

B. Radiation sickness caused by internal irradiation, i.e., by the introduction into the body of radioactive materials by accident, or intentionally for therapeutic purposes, with subsequent irradiation of certain parts of the organism.

The term radiation sickness, like sea sickness, refers to a number of different manifestations of disease and although the term has been used in the past for the description of an illness that occurs in patients treated with X-rays it may properly include all manifestations of disease produced by ionizing radiation, ranging from acute signs such as nausea and vomiting to the delayed manifestations such as severe anemia and tumors.

An excellent and dramatic account of acute and subacute radiation sickness has recently been given by Hersey in his account of Hiroshima and it need hardly be elaborated further. With respect to the more delayed and chronic manifestations of radiation sickness one might point to the unfortunately large number of physicists and roentgenologists who—in the beginning due to ignorance and later due to negligence—have become victims of their profession by developing malignant tumors in chronic X-ray and radium burns of the skin. Another instance of delayed irradiation effect is the occurrence of severe anemia and of bone tumors in workers of the radium-dial painting industry. Here the development of fatal bone tumors has rather conclusively been demonstrated to occur in consequence of localization of radium salts in the bones and the continuous emission of alpha and gamma rays in living tissue. It might be added here that almost every manifestation of radiation sickness in man can be duplicated with ease in the experimental animal: from acute loss of white and red cells in the blood to the development, in imposing numbers, of bone tumors in animals injected with various radioactive isotopes.

III

Two intentional explosions of fissionable materials over Hiroshima and Nagasaki have killed tens of thousands of people and it has been estimated that about 5 per cent of the casualties have died as the result of irradiation. This percentage might yet increase by a certain number of delayed radiation deaths in the future. If so many people had not perished rapidly from blast or heat, the number of radiation deaths would undoubtedly have been much larger.

Two accidental chain reactions of plutonium have resulted in deaths of two scientists at the Los Alamos Laboratory in New Mexico during the last year.

Unfortunately it has proved to be impossible to materially alter the course of the eventually fatal disease in the case of the two scientists accidentally exposed to an instantaneous large dose of radiant energy at the Los Alamos Laboratories. The same might safely be assumed of the many people who died from irradiations in Japan. This would probably have been true even if adequate hospital facilities had existed at the time of the two explosions at Hiroshima and Nagasaki or if it had been possible to hospitalize such patients elsewhere immediately or soon after exposure.

Although certain unspecific and largely supportive therapeutic measures have been of some value in the past in the treatment of radiation sickness, it is on the whole singularly disappointing to observe the lack of specific or effective therapy. Present day information on the mechanism or mechanisms of action of ionizing radiations falls short by far of providing the physician with adequate information for a rational and successful treatment of radiation sickness. Although much is known of the acute and chronic effects of radiant energy on humans and although a vast body of knowledge exists today with regard to the biological effects of this energy on animals and plants, no method is available which would permit us to look, if only with a slight amount of confidence, into the future concerning the management of patients who suffer from acute or subacute radiation sickness.

IV

Like radiation sickness caused by external irradiation that due to internal irradiation is primarily a problem of prevention. A number of deaths are known to have occurred within the last decades following the administration of radioactive materials. Some patients have died shortly after the administration while others died from tumors after a prolonged period of exposure.

Hazards in atomic energy plants are manifold and they may roughly be divided into the following categories:

1. Hazards arising from contamination of laboratory tools and equipment and of air with radioactive chemicals and dusts. These may be present either in considerable amounts and thus the hazard is obvious; or they may be present in almost imperceptible quantities and yet be very dangerous due to contamination of intact body surfaces (skin, air passages, alimentary tract) and subsequent absorption and redistribution in various parts of the body with the danger of rather permanent localization in tissues such as the bones (as was, for instance, the case with radium in radium workers).

2. Hazards arising from injuries received while working under these conditions, i.e., contamination of wounds with radioactive substances with an even greater danger of absorption, redistribution and localization in the body.

3. Hazards arising from exposure of personnel to various types and amounts of external radiation.

It has been pointed out repeatedly that successful protection of the health of personnel has been one of the outstanding

accomplishments on the Atomic Energy Project. Careful planning and constant monitoring have made the plants of the Manhattan District a safe place of work in the face of the most potent and potentially dangerous sources of energy. It is to the credit of those who have during the last few years been concerned with the protection of personnel in the Manhattan District that, so far as is known to the writer, no major emergency has arisen as a result of contamination of air, equipment or of wounds with radioactive substances. Industrial and preventive medicine probably has no parallel in the success that has been achieved.

Safety of personnel has depended in the past and continues to depend not only on the vigilance of the monitoring authority but to a considerable extent on the vigilance and cooperation of the scientists, that is, on the realization on their part that their work belongs in the group of "Dangerous Trades" as they have been called by Alice Hamilton. Consciousness of the dangers involved in the work has gradually developed in the scientists of this project: it can and should be developed further.

One of the first steps in the relaxation of security rules has been the announcement by the Manhattan Project of the availability of radioactive isotopes to civilian workers in scientific institutions throughout the country. This most desirable and welcome development poses new questions with regard to the protection of health of workers in these laboratories.

The official Manhattan District form on which requests for radio elements are to be submitted is cognizant of this danger, for it requires a description of instrumentation available and of experience of personnel in radiation monitoring for health protection.

The rapid spread of radioactive materials into the Laboratories of the Nation is going to pose a most serious problem of decontamination 5 or 10 years from now unless the most rigorous health and disposal rules govern the distribution of radioactive substances and unless the people who will be permitted to work with these substances have demonstrated that they are thoroughly familiar with the handling of radioactive isotopes and that they are aware of the health hazards involved in the work.

It was difficult and it took time to convince the scientists on the Manhattan Project to exercise extreme caution and care in their work. Will it be possible to educate—overnight so to say—a host of others to be equally careful and patient in their work?

V

Another problem which becomes acute with the growing distribution of radioactive isotopes for research and therapy is the toxicity of certain radioactive substances that may be considered as potentially useful for therapeutic purposes.

It was pointed out earlier that radium salts are known to have been causally related to the occurrence of tumors in man. Animal experiments have shown that radium and other relatively long-lived radioactive isotopes have produced bone tumors in a significant number of experimental animals.

Radioactive phosphorus, iron and iodine are some of the substances known to have been administered to man in very small amounts. One wonders whether unpleasant surprises are not in store for us if therapy with radioactive isotopes is to be attempted on a large scale before the toxicity of these substances has been carefully investigated.

It might be proper to point out here, that it is erroneous to believe that radioactive substances have as yet benefited patients to an extent that would make this treatment one of the principal tools in the armamentarium of the physician. On the contrary, few therapeutic endeavors are as much in infancy as the therapy with radioactive substances. This is the case in spite of the fact that many of these substances were available for the study of biological phenomena and for treatment several years before the first pile was built. Recent events have only accelerated a development which was already well under way in 1942, and it will be some time before the therapy with radioactive materials will be as well established as is the therapy with sulfa drugs and penicillin, both of which have been developed and established in a much shorter period of time. As a matter of fact, one wonders sometimes whether therapy with radioactive substances will ever be a significant and indispensable tool in the hand of physicians as many appear to believe at present. It seems much more likely that our understanding of fundamental, normal and abnormal, biological processes will be considerably enhanced by the application of radioactive and other isotopes and that the better understanding gained in this way may lead to a more rational and perhaps non-radioactive treatment of disease.

VI

Many more examples could be cited in order to prove the importance of knowing much more than we do now about the toxicity of radioactive isotopes and about the mechanism, nature and pathogenesis of radiation sickness in all its aspects, whether it be due to external or internal irradiation.

Radiation sickness, although an artificial disease, might in importance take its place among spontaneous natural diseases. Like the latter it might also prove to be amenable to specific treatment in the future. It need hardly be stressed how important this may prove if atomic war is ever permitted to occur.

In spite of all our studies, it is a matter of record that we are at present in no way better prepared and equipped to deal with an emergency involving external radiation injury than we were prior to the inception of the Atomic Bomb Project.

In view of the rapidly expanding exploitation of nuclear fission for various purposes, clinical and laboratory investigation of all aspects of radiation sickness becomes a primary concern to those responsible for the welfare of the people connected with such developments and to all physicians interested in the welfare of the population as a whole.

BRITISH ATOMIC ENERGY BILL PASSED

The bill for domestic control of atomic energy in Great Britain, first read in the House of Commons on May 1, came up for second reading on October 8. After a general debate opened by Prime Minister Attlee, the Bill was considered in Committee on October 11, adopted without essential changes, given a third reading in the House and passed without division.

The main criticism of the Bill centered on Article 11, the security provision, which makes it a crime to reveal without the consent of the Minister of Supply, any document (or other material) describing existing or proposed plants, the purposes or methods of their operation, or any process used in them. Several Labor members advocated abolition of this provision. Another hotly debated point was the suggested addition of a new article providing for an Advisory Committee of scientists to advise the Minister of Supply (to whom the Bill gives full authority over atomic energy developments). The government sharply opposed this suggestion, which was then dropped.

We hope to present a digest of the Bill, and, space permitting, a report on the debates in the House of Commons, in the next issue of the Bulletin.

Atomic Energy and U.S. Patent Policy

Part 1: History of the Patent System . . . . . Casper Ooms

Commissioner Ooms has written two articles on patents for the BULLETIN: The first, printed below, deals with the general background of the U.S. patent policy; the second, which analyzes the patent provisions of the Atomic Energy Act will appear in our next issue.

The translation of the subject of atomic energy from the field of fundamental research and speculative fiction into the realizable promise of industrial applications has raised all of the questions that accompany a profound discovery in industrial techniques, besides the many political questions which have arisen because of the military applications of atomic energy. Necessarily the question of patents is among those which must be considered in any worthwhile plan for the most advantageous exploitation of this resource.

Any treatment of the subject of patents must begin with a consideration of the theories responsible for our patent system, the precise limits of control embraced by our patent laws, and the current practices with respect to the utilization of patents. With that foundation the peculiar problems raised by the subject of atomic energy may be considered.

Historically the patent system of all industrial countries arose from the desire to encourage the development of domestic industry. In our country the patent system has undergone extensive alterations since the practices of Colonial days. The statute now in force in the United States was enacted in 1870 and reenacted in 1874 as part of the United States Revised Statutes with numerous changes made from time to time.

DEFINITIONS OF PATENTABLE INVENTIONS

The several limitations which appear in this statute are worthy of note. In the first place, the American practice differs from that of Great Britain in that only the inventor himself can procure a patent; in other countries the owner who has acquired the invention by assignment from other inventors may file an application and procure a patent. In Great Britain and other countries the importer of an invention may procure a patent. In the United States only the first and original inventor may make the application.

The subject matter of patentable invention is quite limited by the statute, being confined to arts, machines, manufactures, compositions of matter, and designs. The statute has thus been limited from its very origin to exclude practically all fundamental scientific discoveries. The term "art" as it appears in the Act has been defined to be synonymous with the term "process". The term "machine" is clear and includes every mechanical device used to perform some function, thus embracing a structure that may be as simple as the lever or as complex as an automatic calculating machine. The term "manufacture" comprehends almost every type of article made by man. "Compositions of matter", which are separately prescribed by statute, may be defined as substances formed by the intermixture of ingredients or new chemical compounds.

In the project of producing fissionable materials in which the United States has been engaged these various inventions may have been encountered many times. The intricate procedures for the separation of fissionable materials were all processes defined in the statute by the term "art". The elaborate mechanical apparatus employed in handling and processing the materials are machines. Plutonium might doubtless be considered a "manufacture". Denatured plutonium, suggested in recent discussions of the control of fissionable materials presumably would be a manufacture or a "composition of matter".

Whether or not such contributions to the field of atomic energy are patentable depends upon another consideration and that is that the subject matter of the patent shall constitute an invention. The term "invention" has never been adequately defined in our patent law. It clearly excludes all obvious contributions. Courts have demanded that the intellectual quality of the contribution must be greater than mechanical skill or the routine ingenuity encountered among skilled practitioners in any field. This leaves the standard to be applied an exceedingly intangible and elusive test and necessarily results in frequent unsatisfactory determinations. The subjective character of the determination has the further unhappy effect of rendering uniformity in its application practically impossible, with the result that in a large organization such as the United States Patent Office with a great many of technically proficient men intrusted with the problem of determining the presence of invention in the respective applications which pass before them, great variations can be detected in the level of ingenuity being applied by the respective examiners. Similarly, when patents are brought before courts in litigation, widely varying determinations are inevitable. The statute itself gives no aid as the only prescription expressed there is the requirement that the applicant for a patent be an inventor.

The statute does impose other limitations upon the inventions presented for patenting. The invention must be new and useful. The test of utility is a simple one in which all that is required is that the invention be capable of being put to some useful purpose. The law makes no distinctions as to the quality of uesfulness involved but merely demands that the device be capable of some use other than a wholly immoral or legally prohibited use. Thus, an atomic bomb, although capable only of effecting destruction, is useful within the meaning of the patent law. On the other hand, a machine or device, for example, which could be used only for gambling might be held to be without legal utility, although this might be questioned inasmuch as gambling is not universally prohibited.

The final requirement for any discovery or invention to be patentable is that it be new. Under the United States Patent Law this means that the applicant for the patent must himself have made the invention and that there shall have been no previous knowledge of it. It is not sufficient merely that the inventor independently made the invention and it was unknown to him that others previously knew of the invention. The statute previously quoted sets forth further that the subject matter of a patent application must not have been patented or described in any printed publication here or abroad either before applicant's invention thereof or more than one year prior to the filing of the application, and similarly, that the invention shall not have been in public use or on sale in this country for more than one year prior to the time the application is filed. Thus, the inventor is required to move fairly promptly with respect to the filing of a patent application or his invention may be rendered unpatentable by the publication of an article which he himself may have written describing the invention if that article is published more than one year prior to the time of filing his patent application.

Because of the requirements of foreign laws with respect to the effect of publication, it is dangerous for an American inventor to make any publication of his invention before a patent application is filed in the United States Patent Office as the effect of such publication may be destructive of the inventor's rights in the foreign country.

The United States Patent Law permits the inventor to make some public use of

his invention within the year which precedes the filing of his patent application without loss of any rights. This is not true in many foreign countries, and the possibility of knowledge being acquired by others from any public disclosure of the invention renders it hazardous to foreign patenting to make any public disclosure of the discovery prior to the time that the application is filed in the United States.

One problem that frequently arises in the administration of the Patent Law is that relating to the wholly independent invention of the same subject matter by two different inventors at substantially the same time. The United States Patent Law does not guarantee each inventor a patent, but offers the patent to the first inventor. Many foreign patent laws recognize only the first applicant. In the United States an elaborate interference procedure has been established by which the question of priority of inventorship may be determined. Inasmuch as the process of making an invention may be extended in time, it is obvious that complex factual situations arise and present intricate legal questions in the determination of the question of priority.

PRESENT PATENT PROCEDURES

The Patent Act further prescribes the procedure by which an applicant may procure a patent. He is required to file in the United States Patent Office a written application describing the invention and the manner of its use fully and clearly so that a person skilled in the art in which the invention appears may follow the teaching.

Upon receipt of the application by the United States Patent Office, the invention is identified according to the subject matter to which it most nearly relates and is then transmitted to one of the 65 Divisions where the application is examined and a search is made of the prior published art to determine whether or not the subject matter of the application is novel. The Patent Office usually responds to the application with a written statement citing various earlier publications or patents which most closely approximate the teaching of the application and raise such other questions of form or law as require attention. The applicant is then given an opportunity to respond within six months or some shorter period specifically prescribed. Thereupon the applicant may amend the application and make suitable argument in reply to the action of the Patent Office. This procedure is repeated until the application is passed to allowance or finally rejected.

If the Patent Office rejects the application, the applicant is given an opportunity to appeal to the Examiners-in-Chief of the Patent Office and if their decision is unsatisfactory, the applicant may either appeal to the Court of Customs and Patent Appeals or file suit against the Commissioner of Patents in the United States District Court at Washington, D. C.

If the Patent Office grants a patent, the actual grant is issued under the seal of the Patent Office to the inventor, granting to him the term of 17 years from the date upon which the patent is issued "the exclusive right to make, use, and vend" the subject matter of the invention. This right is transferable by the patentee, and may be sold in its entirety or distributed among several persons by grant of separate territorial rights under the invention or the right to practice the invention may be licensed to others for limited periods of time and limited areas of the United States.

MISCONCEPTIONS CONCERNING PATENTS

A great deal of confusion exists in the popular conception of what the patent does. It does not confer on the inventor the right to use the invention as he had that at the time he made it. The patent merely gives the patentee the right to exclude others from making, using or selling the invention, a right enforceable only by suit in the United States Courts.

One of the popular misconceptions with respect to the rights conferred by a patent is the notion that a person may use any invention for his own personal purposes. This is not true. A manufacturer may not build a single machine covered by a patent and use it for his own purposes. This misconception probably arises from the fact that the Patent Law has been construed to exempt from the exclusionary power of the patentee the making or using of the invention merely as a bona fide experiment and without any intention to exploit it for profit. Inasmuch as this doctrine is particularly applicable to questions relating to the development and utilization of fissionable products, the limitations of the doctrine are difficult to define.

With this limitation it may be stated generally that any use of the patented invention within the United States or its Territories by one not authorized to make use of it by the inventor constitutes an infringement which may be enjoined by a court and may also result in a judgment against the infringer for damages.

Another general misconception with respect to patents is that the possession of a patent authorizes the patentee to use the invention disclosed therein. Inasmuch as a patent might be granted upon a broad invention such, for example, as a sewing machine, and a subsequent patent might be granted upon some detail thereof, such as a shuttle mechanism, it is clear that the second inventor could be given no rights with respect to the sewing machine itself, the rights thereto having been granted to the prior inventor of that subject matter. The effect of the coexistence of these two patents would be that the owner of the older or dominating patent could not use the particular improvement invented by the second inventor, and the second inventor could not lawfully use the broad invention patented by his predecessor. By appropriate licensing each could accord the other to use his own invention.

This cursory outline of the Patent Law discloses only the fundamental facts with respect to the patent system. In practice the observable effects of the operation of the system are that hundreds of thousands of people are being encouraged to make inventions and to submit applications for patents to the United States Patent Office. At the date of this writing more than 2,400,000 patents have been issued by the United States Patent Office and of these approximately 700,000 are alive and enforceable, the others having expired upon the termination of the life of 17 years.

Each of these patents contains an exposition of some invention, frequently accompanied by a drawing if the subject matter lends itself to pictorial illustration. Each patent terminates in one or more claims which precisely define the novel part of the disclosure which is claimed by the applicant and which constitutes the subject matter of the grant of the right to exclude.

Each patent thus forms a portion of the technical literature of the art in which it appears and furnishes a teaching which may be universally used upon expiration of the patent and which, meanwhile, may form the basis of experimental work in the same direction or in some alternative direction which can be followed without any invasion of the patent right.

The right to exclude others from the use of the invention not only forms a valuable property which frequently constitutes the incentive leading to production of the invention, but may enable the possessor to enter into the exploitation of the invention with some assurance that he will have exclusive possession of the field for a period sufficiently long to enable him to recoup his investment in research, development, and initial manufacture, and may also enable him to initiate a business against the greater advantages which well-established and larger competitors may possess.

The patent has one other effect in that its possession by one manufacturer compels other manufacturers who would compete in the same field to avoid the patent and make other inventions and thus diversify the gross product of the industry. This compulsion to diversification is no small factor in the contribution which the patent system makes to the country.

Letters to the Editor . . . . . .

Wallace vs. Baruch

With the following two communications, we initiate this section of the Bulletin which we shall devote to criticisms of articles or editorials in the Bulletin. We shall also print significant comments which are two brief for publication as articles. (Though we have appreciated and shall continue to appreciate the letters of commendation we receive, we do not believe them to be as informative to our readers.)

If the organized atomic scientists continue to follow Mr. Baruch's lead in the uncritical spirit lately manifested, it is my belief that their hitherto promising efforts to prevent an atomic armament race will come to nought. The potential contribution of the scientists lies in applying their training in objective observation and thinking to the problems of politics. That is what they started out to do, but only traces of the original attitude can be discerned in the editorial and other comments on the Wallace-Baruch controversy in the October **Bulletin.** If the scientists are to become merely another arm of nationalistic self-righteousness, their political efforts can well be spared.

The scientists on Mr. Baruch's staff are of course obliged to go along publicly with everything he says and does. The rest of us are not. We don't have to accept Mr. Baruch's policies in packaged form. In my view Mr. Baruch is right in his insistence on international control of atomic energy at the source, and on punishment of violators by an international agency. The Russians have no case in their opposition to these two items in the American proposal. But Mr. Baruch is equally wrong in his patriarchal intolerance of criticism, his hostile reaction to Mr. Wallace's temperate comments in the July 23 letter to the President, and, vis à vis both Wallace and the Russians, in his rigidly legalistic and coercive approach to the whole problem of control.

The wording of your comments on Mr. Baruch's memorandum implies that there was something blameworthy in Mr. Wallace's refusal to sign the memorandum drawn up by his representative, Mr. Hauser, and Mr. Swope, acting for Mr. Baruch. Why do you think so? You will recollect that Mr. Wallace had several other weighty matters on his mind when Mr. Baruch summoned him before the bar of judgment. In the oral give and take between Mr. Baruch and Mr. Wallace, either or both men may have said things which were not truly and completely expressive of their views. The two delegates were appointed to draft a definitive statement. It seems to me that Mr. Wallace was not only within his rights in declining to subscribe to the resulting document if it did not embody exactly what he felt, but that he would have been exceedingly remiss had he failed to exercise his prerogative. To yield in a dispute involving only individual interests is one thing, to give way under pressure on a momentous public issue is quite another. As far as I am concerned, Mr. Baruch's handling of the matter is just one more indication of an intransigeant attitude which is one of the road-blocks in the way of an agreement with the Russians. It may be remarked that his great achievements in the country's service were the result of a very different attitude and approach.

More important, however, this intransigence is embodied in the provisions of the American proposal. Coupled with American naval and air maneuvers, it constitutes a hard-boiled diplomatic offensive wrapped up in the usual pious phrases. We offer to turn over to an international authority our atomic know-how and to forego the manufacture and accumulation of atomic bombs at an indefinite time in the future when, in **our** judgment, there no longer remains any danger of the fabrication and use of the bomb by others. In the interim, as a sine qua non of American participation, no other nation will be permitted to develop atomic weapons of its own. In effect all the nations of the world will be on probation, reporting to the United States as the probation officer, until we choose to release them.

How can I say this? Because Mr. Baruch says it—naturally not in such forthright terms. In his latest speech on the subject (at Freedom House on October 9) he quoted from his original declaration: "My country is ready to make its **full** contribution toward the end we seek, **subject, of course, to our constitutional processes and** to an **adequate** system of control becoming **fully** effective, as we finally work it out." I have italicized the qualifying terms to show that, in spite of the added note that "we" refers to all the participating nations, final discretion is retained firmly in American hands. We stand pat on our exclusive possession of the weapon.

This interpretation has been confirmed. In answer to a newspaper reporter's question, Mr. John Hancock explained on Mr. Baruch's behalf (PM, Oct. 10, 1946) that while the stages and timing would be agreed upon beforehand, he could not even hazard a guess as to when the plan would become "fully effective." Mr. Hancock added that this would certainly not be until we were assured that no other nation could illegally manufacture atomic bombs.

During this indefinitely long period before the plan becomes "fully effective," the atomic bomb remains poised over Russian heads. Under these conditions we may expect the Russians to remain as recalcitrant as they dare and perhaps to conclude that their best chance is to try to catch up on their own technological initiative. They can hardly be expected to share the inverted logic exemplified by the remark of Mr. W. Stuart Symington, our Assistant Secretary of War for Air, who, after the flight of a B-29 over the North Pole to Cairo, emphasized the danger **to the United States** of an attack over the polar regions.

The trouble with our plan is that it seeks to prevent an atomic armament race by tying every other competitor to the starting post, while we forge still farther ahead by continuing to manufacture the bombs. Whatever sacrifice of sovereignty is involved on our part is purely a paper sacrifice, since as long as we possess the bases, the carriers, and the bombs, and no other nation commands all three, we can reinstate our sovereign right to wage atomic war whenever we choose. To the Russians this may seem a less remote threat than it does to us. They can hardly be expected to show our equanimity in the face of the shrill cries for a preventive war, the press campaign carried on unremittingly since the end of the last war, the demand to stop appeasing them and to get still tougher, and all the other manifestations of American belligerence beating in great waves against the official policy of moderation. They do not know how long the wall will stand—nor do we who support it.

If there were no safe alternative to Mr. Baruch's plan he and his colleagues would not be open to criticism. But there is an alternative. Mr. Wallace has outlined it in general terms. I should like to offer a specific suggestion which involves

no material risk on our part and which might lead us out of the existing impasse. The United States could make a formal declaration that it will forego the use of atomic weapons for a specified period, pending agreement on a covenant binding all nations not to manufacture weapons of mass destruction in this or broader categories, this agreement to include the inspection and other provisions of the existing American proposal. But more than words are needed. The declaration should be accompanied by a commitment to destroy, or to turn over to the military arm of the UN Security Council, the bomb mechanisms already produced, and to discontinue manufacture of bomb parts and assemblies. Only these— the manufacture of fissionable materials would continue.

This would admittedly amount to little more than a demonstration of good will. If a firm agreement had not been reached by the expiration date, we should be freed from our commitment and the situation would revert to its present status. The military sacrifice on our part would be slight. Nevertheless, such a gesture, made unilaterally and without the usual demand for a quid pro quo, might improve the international atmosphere and encourage a more conciliatory attitude on the part of the Russian negotiators. Certainly it is something we have not tried.

If, without the atomic bomb, the United States were in a militarily inferior position; if, however, we were in danger of instant attack, this proposal would be impracticable. We could not spare, even for a limited period, the one weapon which stood between us and possible defeat. But we find ourselves in no such situation. The United States, without the atomic bomb, is far superior to Russia in industrial capacity and in every military branch except ground forces. The Russians have no navy worth mentioning, no long-range bomber fleets. They will have long-range guided missiles sooner or later, but we should experience no difficulty in maintaining parity with them in this field, or better. They certainly cannot produce atomic bombs in quantity for several years. We, on the contrary, already have enough bombs on hand to wipe out the chief Russian industrial centers overnight. If we decline to take the step advocated, it will not be for reasons of security, but because it is inconsistent with the hard-boiled diplomatic technique which we are practicing.

It is not encouraging, but neither is it surprising, that the one man with the courage to raise his voice against that technique and its somber implications has been forced out of the Cabinet amid the ululations of the press. It is somewhat surprising that the atomic scientists, in their quieter tone, have joined the forces arrayed against Mr. Wallace. I do not know if this represents the consensus of scientific opinion. I hope not. Unless the scientists are capable of a patriotism no less fervent than Mr. Baruch's, but more modern and enlightened, the general outlook becomes even a little darker. The effect on scientists as a social group can also be forecast. They will be relegated once more to the position scientists and engineers have traditionally occupied. They will be makers of tools, and tools themselves—no more than that. If war is happily averted, it will be none of their doing.

Carl Dreher

Military Support of Research vs. National Science Legislation

As a consequence of the remarkable wartime technological developments which resulted from the application of basic scientific knowledge acquired by peacetime research, many groups who are concerned primarily with the applications of science to practical ends have come to recognize the value of truly fundamental research. The Army and Navy are outstanding examples, and it is highly commendable that, recognizing the value of fundamental research, they have assigned extensive funds to universities, under liberal contracts which permit research relatively free of restrictions. But the fact that scientists must depend on the Army and Navy for their funds may ultimately defeat the purpose for which these funds are provided. In raising this criticism it should be made clear that it is not the Army and Navy who are at fault: they have acted most intelligently in recognizing the need for a more adequate support of basic research; this criticism is directed at the American Congress for its delay in passing the bill establishing a National Science Foundation.

The reason for the undesirability of military sponsoring of research lies in the nature of fundamental research and in the atmosphere necessary for its pursuit. Fundamental research consists of the discovery and elucidation of natural phenomena and the subsequent formulation of the basic laws of nature. Very often such discoveries and laws have no immediate practical applications, serving only as a contribution to the general framework of theory which is a fundamental part of science. History teaches us that these researches have often the greatest significance in the light of later discoveries. A striking example is the development of the practical utilization of atomic energy, which depended on chemical and physical knowledge dating back many years in scientific history, extended by individual investigators in many lands.

For this kind of research a certain atmosphere is required. The scientist must be free to exercise the full range of his curiosity and imagination, without having to justify his experiments for the practical minded, or to seek practical application of his theories, or to write monthly reports. For its most fruitful fulfillment, fundamental research must be completely divorced from concern with practical matters of this sort. Grants for fundamental research should be made at the discretion of a civilian board made up of scientists qualified to judge the value of a research project, and above all the researcher. Such a decision should not reside in a military or political officer, nor should a scientist be accountable for his work to a military or political officer.

Only under conditions of completely free fundamental research will the best possible development of science continue. It is fortunate that funds have become available for the more extensive support of university research; the need for such funds is great. But it should be recognized that Army and Navy sponsoring of research is only a stop-gap arrangement, serving until the time that a National Science Foundation is established by the Federal Government. We therefore urge the speedy enactment of a bill establishing a National Science Foundation.

Otto Stern

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Cambridge Conference of Natural And Social Scientists

A conference was arranged by the Association of Cambridge Scientists to explore the possibilities for cooperative research and action by social and physical scientists in the field of atomic energy. The main objective of the conference was to examine the problems raised by atomic energy in order to determine the areas requiring further study, research and discussion; the conference made no attempt to arrive at definite conclusions regarding these subjects.

On Sunday afternoon, October 27, the conference voted to set up a Continuing Committee, charged with the responsibility of considering ways and means of implementing the recommendations, made by the various panel groups and by the conference as a whole, for study and action. This committee consists of: Prof. Merle Fainsod—Chairman, Government Dept. Harvard University; Prof. Seymour E. Harris—Dept. of Economics, Harvard University; Prof. Donald C. McKay—Chairman, Committee on International and Regional Studies, Harvard University; Prof. Talcott Parsons—Chairman, Dept. of Social Relations, Harvard University; Prof. Karl Deutsch—Dept. of History, M.I.T.; Prof. Bernard T. Feld—Dept. of Physics M.I.T.; Prof. Herman Feshbach—Dept. of Physics, M.I.T. Prof. Ronald Lippitt—Research Center for Group Dynamics M.I.T.; and Prof. Victor F. Weisskopf—Dept. of Physics, M.I.T.

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